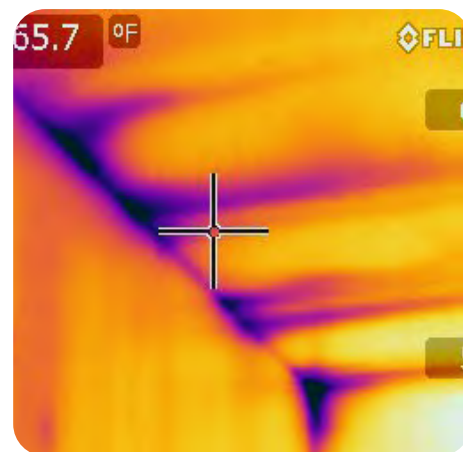
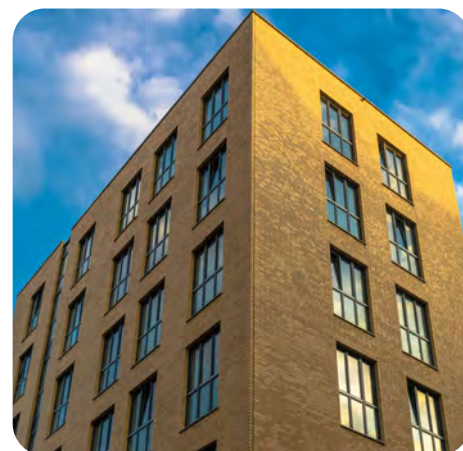


# RETROFITTING MISSOURI

## STANDARD WORK SPECIFICATION-ALIGNED FIELD GUIDE



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES  
**DIVISION OF ENERGY**

Last updated March 16, 2021  
Created by the Energy Smart Academy at Santa Fe Community College  
For the Weatherization Collaborative  
In alignment with the Standard Work Specifications  
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# 1-1 INTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP



## BEFORE

- ✗ Homes built before 1978 have the potential for lead paint and require special considerations during retrofitting



## AFTER

- ✓ No lead dust or debris remains inside the home
- ✓ Contaminated materials have been disposed of or cleaned properly
- ✓ Disposal containment is securely closed

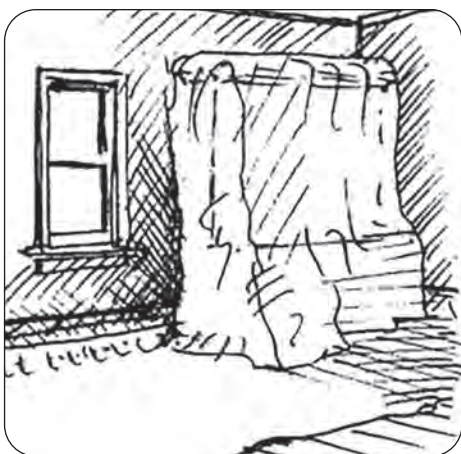
## TOOLS

- Zip Walls
- HEPA Vacuum
- Hand Tools or Shrouded Power Tools
- Half or Full-face Respirator (Fit-Tested)

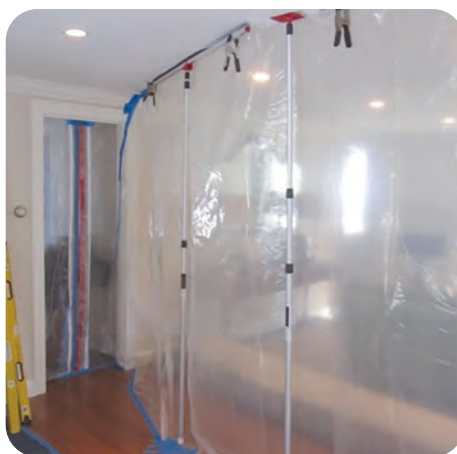
## MATERIALS

- 6-Mil Plastic Sheeting
- Signage
- Tack Pads
- Painters Tape
- Trash Bags
- Disposable Tyvek Suits
- Booties
- Nitrile Gloves
- P-100 Filters

## 1-1 INTERIOR LEAD-SAFE WEATHERIZATION



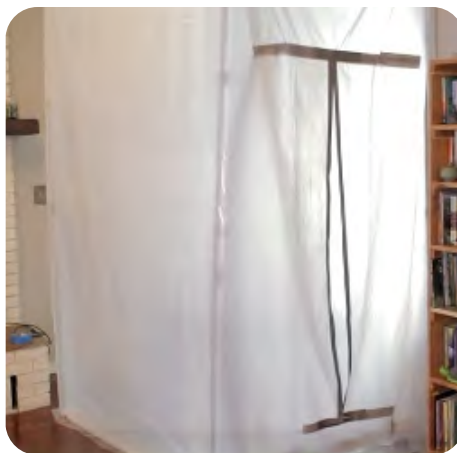
1. Move furniture out of work area and, if it cannot be removed, securely cover horizontal with plastic sheeting



2. Use disposable physical barriers to mark out and contain work area dust and debris



3. Six feet in any direction from the work area, cover surfaces with plastic sheeting, taped in place, including HVAC access points



4. Block off access doorways and install zippers to contain debris in work area

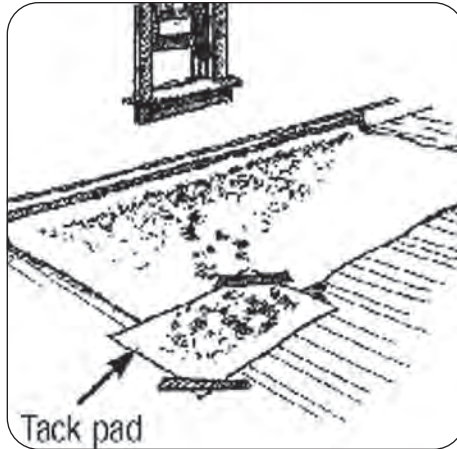
### NOTES

Half and Full-face respirators, required for Lead Renovation work, must be fit-tested on all workers at least once a year. The respirator must form a tight seal at the face and neck. Workers who have a beard cannot wear a half- or full-face respirator, since they will not form a tight seal and contaminants can bypass the respirator. Bearded workers need to wear a PAPR, or powered air-purifying respirator.

## 1-1 INTERIOR LEAD-SAFE WEATHERIZATION

### CAUTION

**RENOVATION WORK  
DO NOT ENTER WORK AREA  
UNLESS AUTHORIZED  
NO SMOKING, EATING, OR  
DRINKING**



5. Post signs outside work area to prevent anyone from entering work area unintentionally

6. Use tack pads at access points to containment area to minimize dust and debris being tracked outside area



7. Wear appropriate PPE, including Tyvek suit, gloves and P-100 HEPA Disposable or Fit-Tested Respirator



8. Use hand tools or shrouded tools that minimize dispersion of dust and debris

### NOTES



## 1-1 INTERIOR LEAD-SAFE WEATHERIZATION



- 9.** Wipe down surfaces and vacuum work area, taking special care and attention of cracks and crevices where dust and debris might collect



- 10.** Carefully roll up and dispose of any plastic sheeting or other disposable materials in the work area



- 11.** Doff PPE outside, avoiding contact with contaminated surfaces of suit, gloves, etc., and dispose immediately

### NOTES



# 1-2 EXTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP



## BEFORE

- ✗ Homes built before 1978 have the potential for lead paint and require special considerations during retrofitting



## AFTER

- ✓ Detailed attention needs to be paid to every aspect of work with lead-based paint, from start to finish

## TOOLS

- HEPA Vacuum
- Hand Tools or Shrouded Power Tools
- Half or Full-face Respirator (Fit-Tested)

## MATERIALS

- 6-Mil Plastic Sheeting
- Catchment Poly Bags
- Signage
- Tack Pads
- Painters Tape
- Trash Bags
- Scaffolding
- Disposable Tyvek Suits
- Booties
- Nitrile Gloves
- P-100 Filters

## 1-2 EXTERIOR LEAD-SAFE WEATHERIZATION



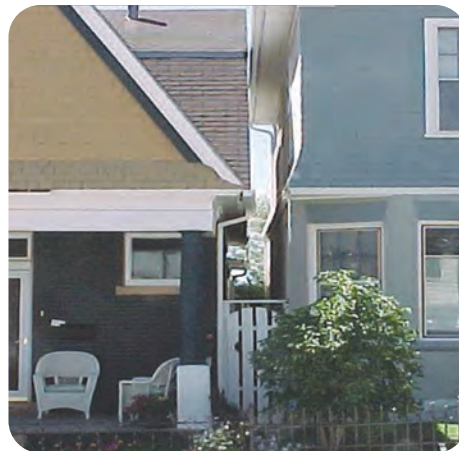
1. Create containment area with plastic sheeting 10 feet in any direction from work area



2. Post signs at least 20 feet from work area to prevent anyone from entering work area unintentionally



3. Seal off all exterior access points to home within containment area, including windows, doors, mail slots and vents



4. Where houses are located close together, vertical containment will be necessary

### NOTES

Half and Full-face respirators, required for Lead Renovation work, must be fit-tested on all workers at least once a year. The respirator must form a tight seal at the face and neck. Workers who have a beard cannot wear a half- or full-face respirator, since they will not form a tight seal and contaminants can bypass the respirator. Bearded workers need to wear a PAPR, or powered air-purifying respirator.

## 1-2 EXTERIOR LEAD-SAFE WEATHERIZATION



- 5.** Tape plastic up onto work surface and use systems to catch debris while limiting damage to exterior plantings



- 6.** Don proper PPE, including tyvek suit with hood, gloves, booties and half- or full-face respirator (see notes). Be aware of potential for thermal stress when working in full PPE



- 7.** Use hand tools or shrouded power tools to limit dispersal of contaminated dust and debris



- 8.** Clean work area and carefully fold and dispose of plastic sheeting



- 9.** Doff PPE outside, avoiding contact with contaminated surfaces of suit, gloves, etc., and dispose immediately

### NOTES

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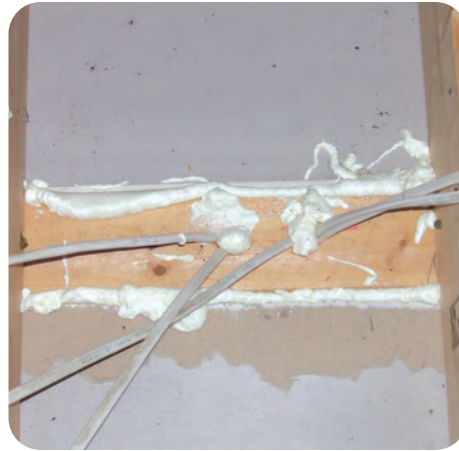
## 2-1 AIR SEAL TOP PLATES IN ATTIC

Aligns with SWS [3.0101.1](#), [3.0102.11](#)



### BEFORE

✗ Air can move around unsealed top plates in attic, making new insulation less effective



### AFTER

✓ Seal perimeter at all gaps and extend sealant up onto adjacent materials

### TOOLS

- Caulk Gun
- Spray Foam Dispensing Gun

### MATERIALS

- Caulk
- 1-part Polyurethane Spray Foam
- Mastic



Apply caulk to areas with gap 1/4 inch or smaller



Apply sprayfoam or mastic to gaps 1/4 inch to 2 inches wide

### NOTES

## 2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

Aligns with SWS [3.0101.1](#), [3.0102.9](#)



### OPTION A SEAL SOFFIT INTO CONDITIONED SPACE

Soffits, coffered ceilings and other design details can create lower sections in the ceiling line and often are not sealed or insulated properly



### OPTION B SEAL SOFFIT OUT OF CONDITIONED SPACE

From the attic side, it is best to determine if it's better to leave the soffit connected to the conditioned space (inside the house) or seal it off as part of the unconditioned space

### TOOLS

- Caulk Gun
- Utility Knife
- Measuring Tape
- Drill
- Spray Foam Nozzle

### MATERIALS

- Spray Foam
- Lumber for Support
- Expanded Polystyrene (EPS)
- Extruded Polystyrene (XPS)
- Gypsum Board
- Plywood
- Caulk
- Mechanical Fasteners



## 2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

### OPTION A - SEAL SOFFIT INTO CONDITIONED SPACE



**A-1.** For openings larger than 24 inches, support braces will be necessary



**A-2.** Attach bracing across joists securely, spacing no more than 24 inches apart



**A-3.** Apply sealant along top plates, bracing, and framing members adjacent to opening more than 24 inches apart



**A-4.** Place Infill material over opening and secure in place with mechanical fasteners

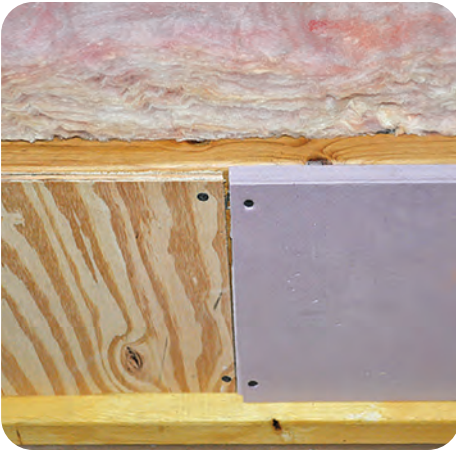


**A-5.** When support bracing has been used, screw infill material to bracing as well

### NOTES

## 2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

### OPTION B - SEAL SOFFIT OUT OF CONDITIONED SPACE



**B-1.** Seal off framed openings with rigid material, such as gypsum board, XPS, EPS, or OSB



**B-2.** Seal around infill materials

### NOTES

## 2-3 AIR SEAL AN ATTIC CHASE OR SMALL OPENING

Aligns with SWS 3.0101.1



### BEFORE

✗ Open chases for electrical and plumbing allow air movement from subspace or conditioned space



### AFTER

✓ When properly sealed, air movement will cease through these spaces

### TOOLS

- Measuring Tape
- Drill
- Utility Knife
- Caulk Gun
- Spray Foam Gun

### MATERIALS

- Extruded Polystyrene (XPS)
- Expanded Polystyrene (EPS)
- Gypsum Board
- Plywood
- Spray Foam
- Mechanical Fasteners



## 2-3 AIR SEAL AN ATTIC CHASE OR SMALL OPENING



- 1.** Measure the opening of the chase in a location that will maintain the pressure plane



- 2.** Cut material to fit for each space where it is needed, paying attention to locations of wires and pipes



- 3.** Rigid material to cover the span can be XPS, EPS, gypsum board or plywood, as appropriate for the location



- 4.** Seal rigid material into place securely and air seal with caulk, spray foam or mastic



- 5.** Extend sealing to adjacent materials to ensure a complete air seal

### NOTES

## 2-4 AIR SEAL BALLOON FRAMING FROM ATTIC

Aligns with SWS 3.0101.1, 3.0102.4



### BEFORE

- ✗ Balloon framing leaves cavities open from the basement to the attic, allowing for large amounts of air movement



### AFTER

- ✓ By sealing at the top of the cavity, air flow is stopped and the cavity below is another step closer to being ready to insulate

### TOOLS

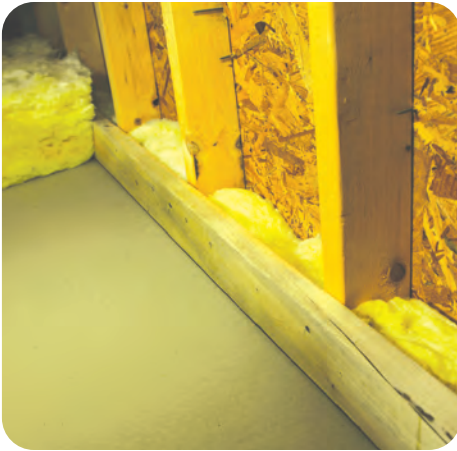
- Measuring Tape
- Drill
- Utility Knife
- Saw
- Sprayfoam Gun
- Caulk Gun

### MATERIALS

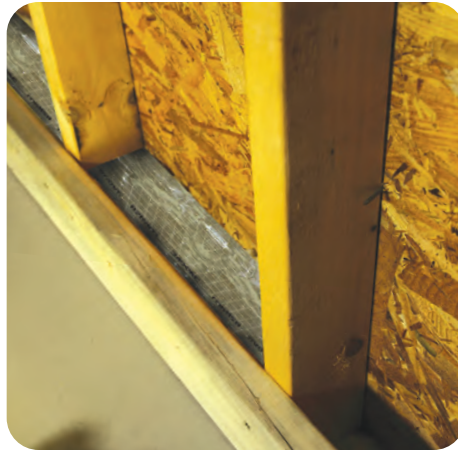
- Extruded Polystyrene (XPS)
- Gypsum Board
- Plywood
- Plastic-wrapped/ Bagged Fiberglass Batts
- 1-part Sprayfoam
- Caulk
- Mastic
- Mechanical Fasteners



## 2-4 AIR SEAL BALLOON FRAMING FROM ATTIC



- 1.** Block the opening of balloon framed sidewalls in alignment with the pressure boundary



- 2.** Blocking material options include lumber, gypsum board, XPS, or bagged fiberglass batts



- 3.** Blocking material needs to be appropriate for potential weight load



- 4.** And securely fastened rigid material to withstand pressure of dense-packing beneath



- 5.** Seal any remaining gaps with caulk or 1-part spray foam, extending sealing to adjacent materials

### NOTES

## 2-5 SEAL INSULATION-CONTACT RATED CAN LIGHTS

Aligns with SWS 3.0101.1



### BEFORE

- ✗ Insulation-Contact rated Can lights are commonly installed in the ceiling between the upper story and the attic, meaning gaps around them allow for significant air leakage



### AFTER

- ✓ By sealing around an IC-rated can light, a continuous thermal boundary is maintained

### TOOLS

- Caulk Gun

### MATERIALS

- Caulk

### NOTES



## 2-6 SEAL ELECTRICAL AND OTHER PENETRATIONS IN ATTIC

Aligns with SWS [3.0101.1](#), [6.0201.1](#), [6.0201.2](#)



**1.** Electrical, plumbing and HVAC penetrations are often oversized



**2.** For smaller gaps, caulk is enough to seal the hole



**3.** Holes larger than 1/4 inch may require support for the sealant



**4.** Inserting backer rod provides infill to support the sealant



**5.** Seal to cover entire opening, including all backer rod

### TOOLS

- Caulk Gun
- Spray Foam Gun
- Utility Knife

### NOTES

For gaps larger than 3 inches, see [2-3 Air Seal an Attic Chase or Small Opening](#)

### MATERIALS

- Caulk
- Spray Foam
- Backer Rod

## 2-7 AIR SEAL A FLOORED ATTIC

Aligns with SWS 3.0101.1



### BEFORE

- ✗ Check floor joist cavities for blocking material and penetrations



### AFTER

- ✓ Air seal cracks and penetrations in floored attic spaces

### TOOLS

- Saw
- Drill
- Measuring Tape
- Utility Knife
- Caulk Gun
- Spray Foam Gun

### MATERIALS

- Caulk
- Extruded Polystyrene (XPS)
- Lumber
- Gypsum Board
- 1-part Spray Foam
- Mechanical Fasteners
- Backer Rod

### NOTES

Spray foam will not be used in spaces that will be exposed to habitable living spaces.



## 2-7 AIR SEAL A FLOORED ATTIC



**1.** With property owner permission, remove flooring material to access cavities



**2.** Remove only as much flooring as necessary to gain access to every cavity and any large air sealing areas



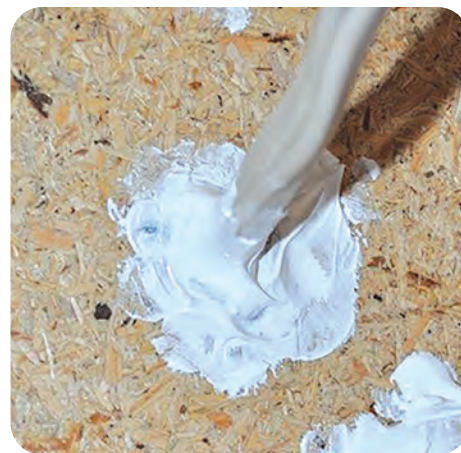
**3.** Place blocking material, as needed, and air seal to hold insulation in place



**4.** In rare cases it may be easier to access to locate blocks from below floored attic spaces



**5.** Air seal gaps and seams in joist cavities as accessible



**6.** Check for and air seal electrical, plumbing, and HVAC penetrations properly



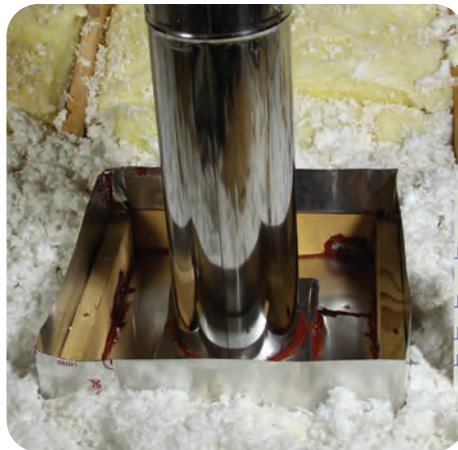
# 3-1 SEAL AROUND CHIMNEYS AND FLUES

Aligns with SWS 3.0102.2



## BEFORE

✗ Even high-temperature sites need air sealing



## AFTER

✓ Maintain 3-inch clearance from flue for all combustible materials

## TOOLS

- Caulk Gun
- Metal Snips or Nibbler
- Drill
- Tape Measure

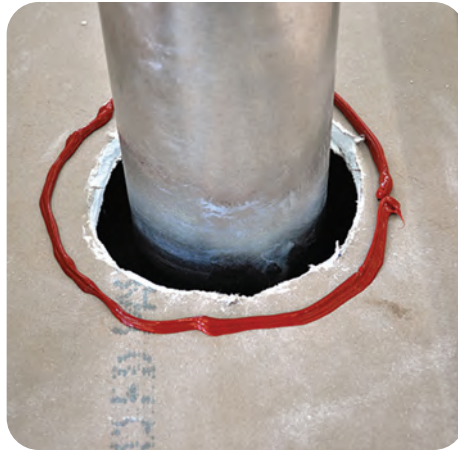
## MATERIALS

- 26-Gauge Sheet Metal
- Mechanical Fasteners
- Lumber

## 3-1 SEAL AROUND CHIMNEYS AND FLUES



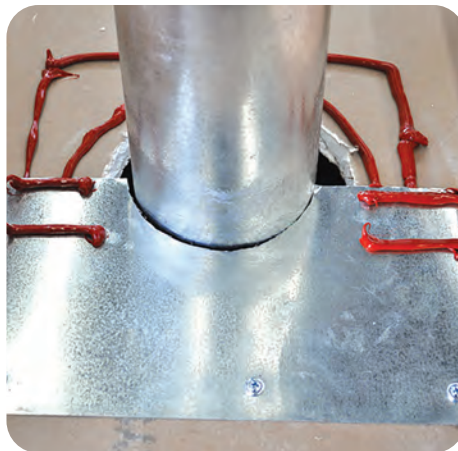
**1.** Select high-temperature caulk sealant that will adjust to temperature differences between materials



**2.** Apply unbroken ring of caulk directly to clean decking around entire perimeter of flue or chimney



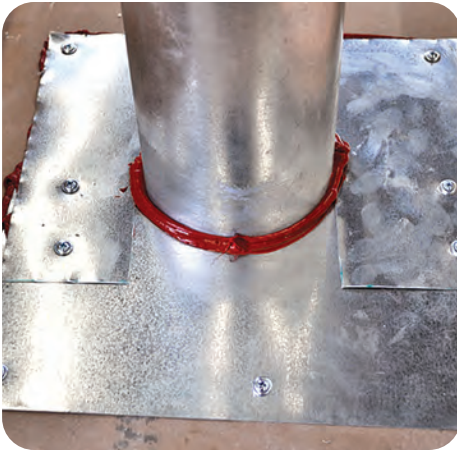
**3.** Apply unbroken ring of caulk directly to clean decking to match perimeter of sheet metal backing



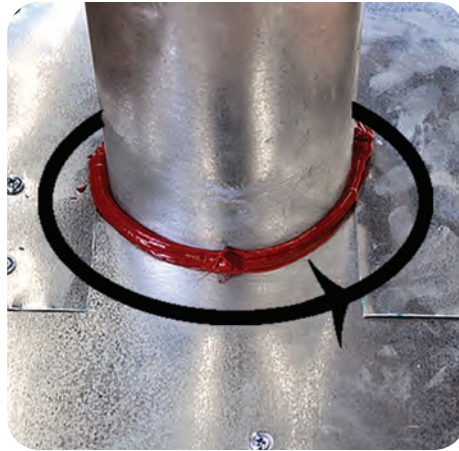
**4.** Install first layer of metal sheeting and apply additional caulk to complete new perimeter for second layer of sheeting

### NOTES

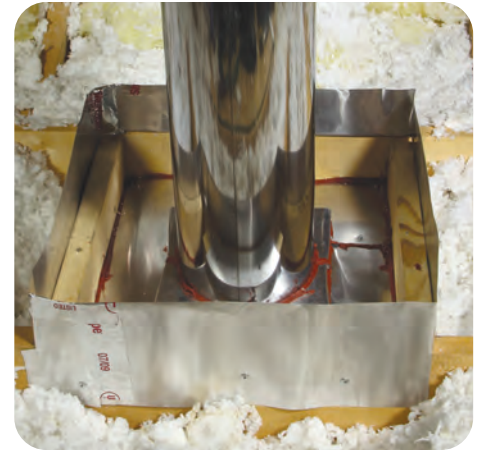
## 3-1 SEAL AROUND CHIMNEYS AND FLUES



**5.** Set second layer of sheeting to complete ring around flue or chimney. Fasten sheeting mechanically



**6.** Run bead of high-temperature caulk around flue at backing to seal remaining gaps  $< 1/4$  inch



**7.** Create a durable, fixed dam, at least 2 inches higher than final insulation level, keeping all combustible materials at least 3 inches away from flue or chimney

### NOTES



## 3-2 SEAL AROUND NON-INSULATION CONTACT-RATED (NON-IC) CAN LIGHTS

Aligns with SWS [3.0102.1](#)



### BEFORE

- ✗ Non-Insulation  
Contact-rated can lights  
create a fire hazard in  
well-insulated attics



### AFTER

- ✓ When boxed with  
appropriate clearances  
and fire-rated materials,  
fire risk is mitigated

### TOOLS

- Measuring Tape
- Utility Knife
- Caulk Gun

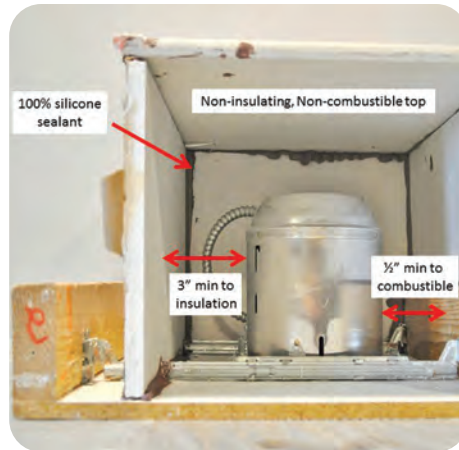
### MATERIALS

- 5/8 Inch  
Gypsum Board
- High-Temperature  
Caulk
- 100% Silicone Sealant

## 3-2 SEAL AROUND NON-INSULATION CONTACT- RATED (NON-IC) CAN LIGHTS



1. Clear any debris from around non-IC-rated can light



2. Enclosure has 3 inches of clearance from lamp to insulation on all sides, at least 1/2 inch from any combustible material, such as wood



3. Premade boxes can make installation easier when installation site is clear of framing members

### NOTES

Non "Insulation Contact" Can Lights are designed to vent heat from the lamp into the cavity around them. They are safe to use in non-insulated cavities, such as the ceiling/floors between different stories in a home. IC-rated Can Lights have a secondary housing to keep the heat of the lamp from contacting the insulation. They are also recommended for use with lower wattage lamps.

## 3-2 SEAL AROUND NON-INSULATION CONTACT- RATED (NON-IC) CAN LIGHTS



- 4.** Seal box on all sides and edges to make continuous barrier from attic, using high temp caulk where appropriate



- 5.** Top of box must be R-1 or less and left free of insulation. Flag enclosure for added visibility

### NOTES

With the help of a licensed electrician, there is also the option of replacing old can lights with air-tight units or LED retrofit inserts. Check program requirements.



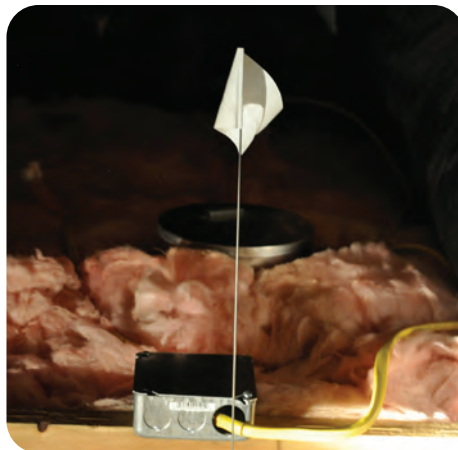
## 4-1 PREPARE ATTIC FLOOR FOR INSULATION

Aligns with SWS [4.0103.1](#), [4.0103.2](#), [4.0103.3](#), [4.0103.4](#),  
[4.0103.5](#), [4.0103.6](#), and [4.0103.8](#)

### BEFORE YOU BEGIN



- ✓ Check for live knob and tube wiring and dam off when possible

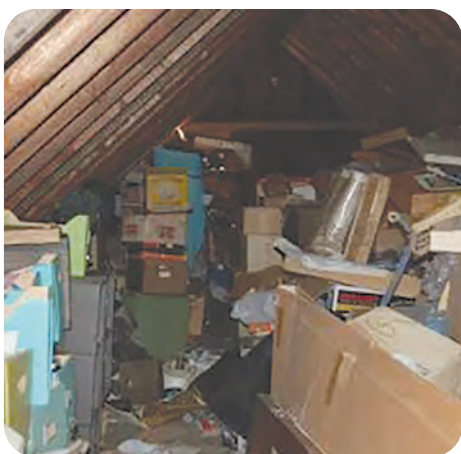


- ✓ Cover junction boxes and attach flag for visibility

### TOOLS

- Non-Contact Tester
- Utility Knife
- Drill
- Hole Saw
- Caulk Gun
- Staple Gun
- Metal Snips
- Nibbler

## 4-1 PREPARE ATTIC FLOOR FOR INSULATION



**1.** Remove stored materials



**2.** Run exhaust fan ducts to outside, insulate to R-8



**3.** Ensure air sealing, if any, is completed



**4.** Install baffles, if needed. Ensure 2 inches of gap for airflow

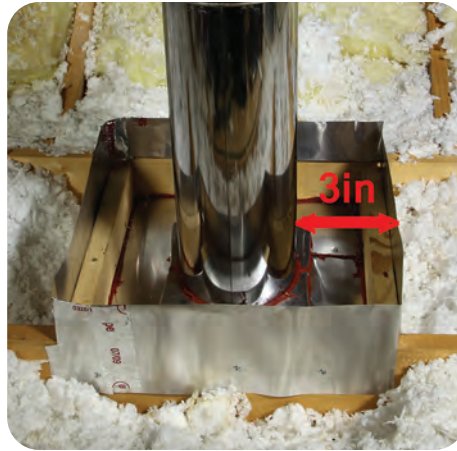
### MATERIALS

- Plywood
- Drywall
- XPS
- Junction Box Covers
- Flags
- Vent Caps
- Rigid Duct
- Mechanical Fasteners
- Foil Tape
- R-8 Duct Insulation
- Soffit Baffles
- Depth Rulers
- 26-Gauge Steel Sheeting
- High-Temperature Caulk

## 4-1 PREPARE ATTIC FLOOR FOR INSULATION



- 5.** Depth rulers installed,  
1 per 300 square feet



- 6.** All dams are built,  
as needed

### NOTES

A licensed electrician  
can replaced knob-  
and-tube wiring with  
updated electrical  
wiring.



# 5-1 DAM SEAL AND INSULATE AN ATTIC HATCH

Aligns with SWS 3.0103.1



## BEFORE

- ✗ Uninsulated attic access points allow conditioned air to escape the home in all seasons



## AFTER

- ✓ Safely and durably sealing and insulating attic access doors prevent air movement and reduces heating and cooling loads

## TOOLS

- Measuring Tape
- Saw
- Drill
- T-Square
- Utility Knife
- Caulk Gun

## MATERIALS

- Lumber
- Mechanical Fasteners
- Extruded Polystyrene (XPS) or Other Rigid Foam Insulation Board
- Foam Tape
- Adhesive
- Latch (optional)

## 5-1 DAM SEAL AND INSULATE AN ATTIC HATCH



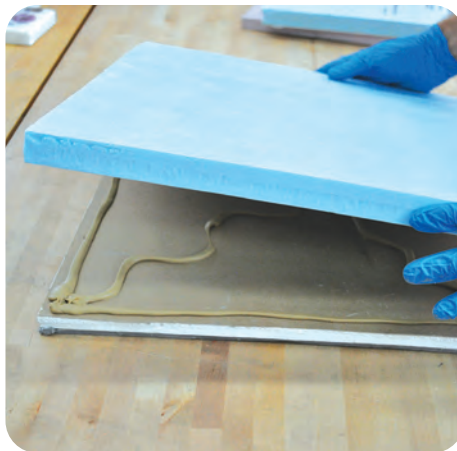
1. Rigid, durable attic hatch blocking/dam is installed in a permanent way



2. Dam is at least 2 inches taller than the final attic insulation depth



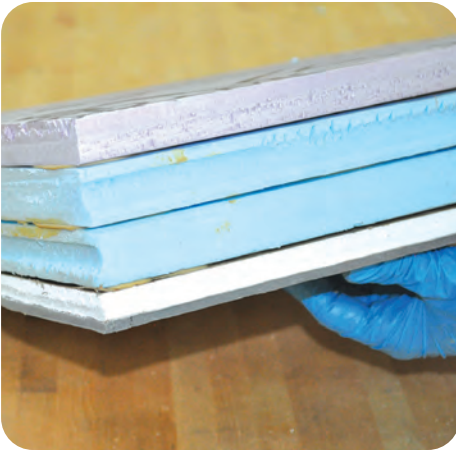
3. Cut gypsum board to hatch size for "friction fit" and air seal bottom of hatch with unbroken ring of foam tape



4. Cut and stack rigid foam insulation, gluing with appropriate adhesive, to build up R-value

### NOTES

## 5-1 DAM SEAL AND INSULATE AN ATTIC HATCH



**5.** Hatch is insulated to proper R-value (the maximum R-value structurally allowable, up to the final insulation level of surrounding attic)



**6.** Trim is air-sealed with appropriate material



**7.** For vertical accesses, run weatherstripping or foam tape to air seal at these doorways too. Hold vertical accesses closed with latch if necessary

### NOTES



## 5-2 DAM SEAL AND INSULATE A PULL-DOWN ATTIC STAIRWAY

Aligns with SWS 3.0103.1



### BEFORE

- ✗ Pull-down stairs can be a weak point in thermal/pressure boundaries, as well as creating a place where insulation can fall down into the home



### AFTER

- ✓ Attic pull-down stairs are safely and durably sealed and insulated to prevent air movement

### MATERIALS

- Extruded Polystyrene (XPS)
- Expanded Polystyrene (EPS)
- Polyiso
- Plywood
- 1-Part Spray Foam
- Spray Adhesive
- Caulk Adhesive
- Foil Tape
- Mechanical Fasteners
- Foam Tape
- Weatherstripping
- Latches

### TOOLS

- |                  |                  |
|------------------|------------------|
| • Measuring Tape | • Spray Foam Gun |
| • Utility Knife  | • Drill          |
| • Saw            |                  |
| • Caulk Gun      |                  |

## 5-2 DAM SEAL AND INSULATE A PULL-DOWN ATTIC STAIRWAY



- 1.** Build cover above and around pull-down stair, taller than final insulation height



- 2.** Insulate top and sides of dam cover, to appropriate R-value



- 3.** Air seal all edges of trim



- 4.** Air seal with foam tape or weatherstripping



- 5.** Install latches to ensure hatch remains closed and air sealed if it does not remain closed with a 'friction fit'

### NOTES

## 6-1 INSULATE AN UNFLOORED ATTIC

Aligns with SWS 4.0103.2, 4.0103.4, 4.0103.6



### BEFORE

Ensure that attic prep work has been completed before starting installation (See 4-1 Prep Attic Floor for Insulation)



### AFTER

#### FINAL CHECKLIST

- ✓ Appropriate insulation material used
- ✓ Correct depth, as specified in work order
- ✓ Insulation level is even

### TOOLS

- Measuring Tape
- Insulation Machine
- Staple Gun

### MATERIALS

- Loose fill fiberglass or cellulose (as per work order)
- Staples



## 6-1 INSULATE AN UNFLOORED ATTIC

Description / Comment	
Attic Insulation - Blown Fiberglass - R-38	
Attic Insulation - Blown Fiberglass - R-38	

**R13 to R60**

**Nature Blend™ Loose Fill Formula**

Coverage Chart for Thermal Acoustical Application

R-Value @ 75°F	Initial Insulation Thickness (Inches)	Minimum Settling Thickness (Inches)	No. Joists (dim adjusted per air space)			2" x 8", 16" O.C.		
			Depth Per 100 Sq. Ft.	Set Coverage Sq. Ft. Per Bag	Minimum Weight Per Sq. Ft.	Depth Per 100 Sq. Ft.	Set Coverage Sq. Ft. Per Bag	Minimum Weight Per Sq. Ft.
13	4.4	4.0	17.4	57.5	0.38	15.8	63.5	0.35
19	6.1	5.5	27.9	35.8	0.61	25.3	39.6	0.56
22	6.9	6.2	33.2	30.1	0.73	30.5	32.8	0.67
25	7.8	7.0	38.6	25.9	0.85	35.8	28.0	0.79
30	9.2	8.3	47.6	21.0	1.00	44.6	22.4	0.98
36	11.4	10.3	62.0	16.1	1.30	58.9	17.0	1.30
48	14.6	13.1	82.0	12.2	1.80	76.7	12.7	1.73
60	17.7	15.9	101.9	9.8	2.24	96.6	10.1	2.17



1. Verify against work order that correct insulation material is being installed
2. Verify insulation depth/density against manufacturer's density chart
3. While installing, regularly check depth of insulation for even coverage and to meet required depth



4. Ensure that insulation does not get into dammed-off areas, such as around chimneys and flues and inside soffit baffles
5. When complete, post insulation certificate by attic entrance

### NOTES

## 6-2 INSULATE UNDER A FLOORED ATTIC

Aligns with SWS 4.0103.6



### BEFORE

✗ Attics with flooring often hide uninsulated cavities



### AFTER

✓ An insulated attic floor provides a continuous, contiguous, safe, and compliant thermal boundary that prevents air movement

### TOOLS

- Measuring Tape
- Utility Knife
- Insulation Machine
- Drill
- Hole Saw
- Prybar
- Caulk Gun

### MATERIALS

- Loose Fiberglass or Cellulose Insulation
- Extruded Polystyrene (XPS)
- Caulk
- Mechanical Fasteners
- Gypsum Board
- Plugs

## 6-2 INSULATE UNDER A FLOORED ATTIC



1. Ensure that floor cavities are blocked securely at both ends



2. If boards can be loosened, pry up as few boards as possible to access all cavities. If flooring is in solid sheets, access holes may need to be drilled



3. Fill entire cavity with insulation to prescribed density



4. Occasionally a homeowner may not want the attic floor to be disturbed. The cavities can also be accessed from below through the ceiling

### NOTES



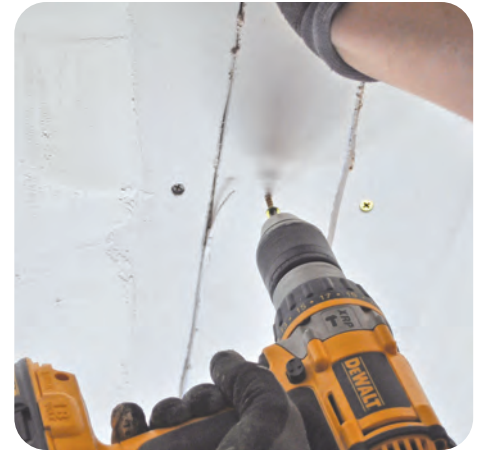
## 6-2 INSULATE UNDER A FLOORED ATTIC



- 5.** Blocking still needs to be put into place



- 6.** Blow insulation to completely fill cavities to prescribed density



- 7.** Fill and reseal access holes to prevent air movement

### NOTES

## 6-3 INSULATE AN ATTIC STAIRWAY

Aligns with SWS [4.0104.1](#), [4.0104.2](#), [4.0104.3](#), [4.0104.4](#),  
[4.0104.5](#), [4.0104.6](#), [4.0201.2](#), [4.0201.3](#), [4.0202.1](#)



### BEFORE

**X** Attic stairways can offer a unique set of insulation challenges. Clearly define where the thermal and pressure boundary are going to be located before starting insulation



### AFTER

**✓** Insulation provides a continuous, contiguous, safe, and compliant thermal boundary that prevents air movement between the attic and the remainder of the home

### MATERIALS

- Kraft-Faced Fiberglass Batts
- Loose Cellulose or Fiberglass Insulation
- Netting
- Furring Strips
- Staples
- Mechanical Fasteners
- Extruded Polystyrene (XPS)
- 2-Part Spray Foam
- 1-Part Spray Foam
- Plywood
- Gypsum Board
- House Wrap

### TOOLS

- |                  |                      |
|------------------|----------------------|
| • Measuring Tape | • Insulation Machine |
| • Drill          | • Spray Foam Gun     |
| • Utility Knife  |                      |
| • Hole Saw       |                      |

## 6-3 INSULATE AN ATTIC STAIRWAY



- 1.** If walls are accessible from the attic side, choose between batt or blown-in insulation



- 2.** Block off open cavities along the line of the thermal/pressure boundary



- 3.** Air seal around blocking material



- 4.** Cut batts to size for each individual cavity, ensuring no gaps remain, locating kraft-paper toward conditioned space



- 5.** For batt insulation, cover installed batts with backing. For blown-in, attach netting to framing members, cut holes in netting and blow in insulation to 3.5 pounds per cubic inch



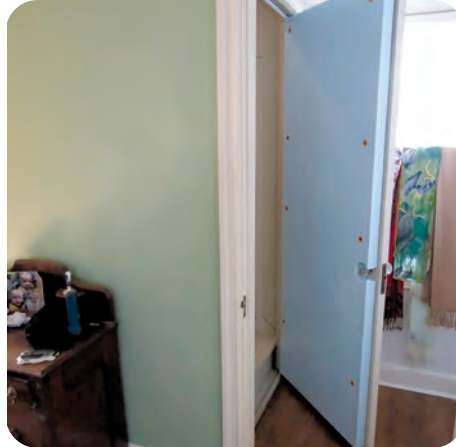
- 6.** If walls are enclosed from attic side, drill holes in stairways walls



## 6-3 INSULATE AN ATTIC STAIRWAY



**7.** Dense pack stairway walls



**8.** Weatherstrip and insulate door



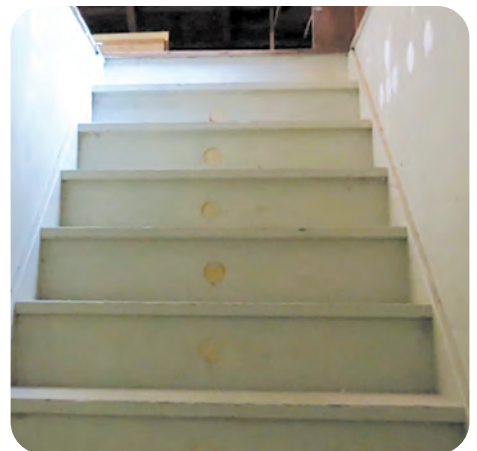
**9.** Insulate under stairway using insulation indicated by work order



**10.** Seal off insulation from conditioned space in home



**11.** If backside of stairs is sealed, blow insulation into cavity behind stairs



**12.** Plug access holes from blown insulation

### NOTES

# 7-1 PREPARE A MANUFACTURED HOME CEILING FOR INSULATION

Aligns with SWS [4.0103.6](#), [4.0103.9](#), [4.0103.10](#), [4.0103.11](#), [4.0103.12](#)



## BEFORE YOU BEGIN

Make any repairs and preparation as noted from assessment, as well as fixing any new issues that could cause the ceiling to be compromised with the additional weight of insulation



## AFTER

### FINAL CHECKLIST

- ✓ Vents all terminate to outside and are properly sealed
- ✓ Flues are dammed properly
- ✓ Ceiling is in good condition to hold weight

## TOOLS

- Measuring Tape
- Utility Knife
- Zip Tie Tensioner

## MATERIALS

- R-8 minimum Flex Duct insulation
- Duct Insulation with Vapor Retarder
- Water Heater Blanket with Vapor Retarder
- Zip Ties
- Twine
- Spray Adhesive
- Mastic
- UL 181 Fiberglass Mesh Tape

## 7-1 PREPARE A MANUFACTURED HOME CEILING FOR INSULATION



1. Ensure plumbing and exhaust vents terminate outside



2. Dam around high temperature flues (Note: Flue in image is in need of work)



3. Replace non-IC rated can lights with IC-rated cans



4. Repair roof leaks or other damage, as possible, or defer job if necessary

### NOTES

Check with your state  
program to find out  
deferral thresholds  
and procedures



## 7-2 MH INSULATION: GABLE END BLOW METHOD

Aligns with SWS 4.0103.9



### BEFORE

✗ Manufactured housing often does not meet regional standards for insulation



### AFTER

✓ Fill entire cavity and reseal gable ends

### TOOLS

- Drill
- Utility Knife
- Hole Saw or Saws-All
- Caulk Gun

### MATERIALS

- Fiberglass or Cellulose Loose Insulation
- Mechanical Fasteners
- Caulk/Sealant

### NOTES

## 7-2 MH INSULATION: GABLE END BLOW METHOD



**1.** Verify integrity of ceiling to hold weight of insulation



**2.** Ground blower hose to reduce chance of electrical build-up



**3.** Remove or fold up gable end to access attic



**4.** Insert blower hose as far as possible and then retract slowly to fill cavity entirely, on each side of marriage wall



**5.** Fill cavity and leave appropriate documentation



**6.** Reseal gable end or install gable vent at peak that has no more than 1/2 inch mesh screen. Repeat all steps from other end, if needed.

## 7-3 MH INSULATION: EDGE BLOW METHOD

Aligns with SWS 4.0103.10



### BEFORE

- ✗ Manufactured housing often does not meet regional standards for insulation



### AFTER

- ✓ Verify reinstallation and proper sealing of edge of roof to ensure no water or pest intrusion

### NOTES

### TOOLS

- Drill
- Utility Knife
- Insulation Machine

### MATERIALS

- Fiberglass or Cellulose Loose Insulation
- Blocking Material
- Butyl Tape



## 7-3 MH INSULATION: EDGE BLOW METHOD



**1.** Verify integrity of ceiling to hold weight of insulation



**2.** Prepare stable work area to access roof edge



**3.** Unfasten and remove J channel from edge of roof



**4.** Clean old butyl tape or putty from J channel and store J channel somewhere safe until it can be reinstalled



**5.** Remove staples holding down edge of roof



**6.** Insert blocks to hold roof edge up approximately 6 inches

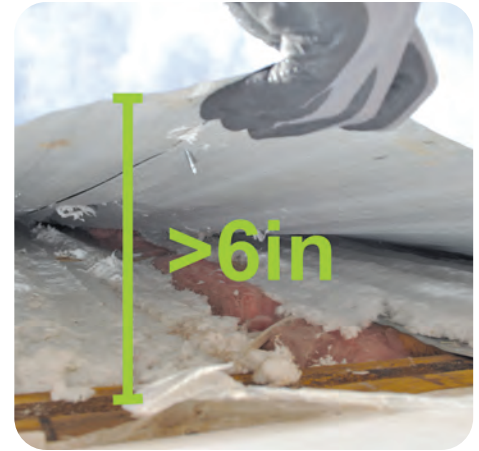
## 7-3 MH INSULATION: EDGE BLOW METHOD



- 7.** Ground the fill hose to reduce chance of electrical build-up



- 8.** Insert blower hose as far as possible into cavity and retract slowly while filling space between trusses



- 9.** Work down the edge of the roof until entire cavity is full



- 10.** Remove blocks and reattach edge of roofing over exterior sidewall paneling



- 11.** Replace butyl tape on J channel



- 12.** Reattach J channel, lapping over edge of roof. Repeat entire process for other side, if necessary



## 7-4 MH INSULATION: RIDGE BLOW METHOD

Aligns with SWS 4.0103.11



### BEFORE

✗ Manufactured housing commonly is underinsulated, particularly older models



### AFTER

✓ After accessing from ridge, ridge cap can be installed or a series of vent caps

### TOOLS

- Drill
- Saw
- Insulation Machine
- Caulk Gun
- Metal Sheers

### MATERIALS

- Loose Fiberglass Insulation
- Sealant
- 26-Gauge Metal Sheeting
- Vent Caps
- Mechanical Fasteners
- Elastomeric Coating



## 7-4 MH INSULATION: RIDGE BLOW METHOD



**1.** Remove ridge cap or cut access holes at ridge, leaving one side attached to put back in place



**2.** Insert blower hose



**3.** Fill all accessible areas



**4.** If not installing ridge or cap vents, replace flaps, patch over with metal and seal with elastomeric

### NOTES

## 7-5 MH INSULATION: INTERIOR BLOW METHOD

Aligns with SWS 4.0103.12



**1.** Drill holes in ceiling to fill each ceiling joist cavity



**2.** Blow insulation into ceiling cavity to appropriate R-value for region



**3.** Continue throughout house to ensure even coverage and no gaps



**4.** Seal all holes securely

### TOOLS

- Hole Saw
- Vacuum
- Insulation Machine
- Caulk Gun

### MATERIALS

- Cellulose or Fiberglass Loose Insulation
- Plugs
- Sealant

### NOTES

## 7-6 MH INSULATION: TOP FILL BLOW METHOD

Aligns with SWS 4.0103.11



### BEFORE

**X** Attics in older manufactured housing are often underinsulated or poorly insulated



### AFTER

#### FINAL CHECKLIST

- ✓ Provide a continuous and safe thermal barrier
- ✓ Protect integrity of roof

### TOOLS

- Saw
- Insulation Machine
- Caulk Gun
- Paint Brush
- Drill

### MATERIALS

- Cellulose or Fiberglass Loose Insulation
- All-Weather Adhesive
- Sheet Metal
- Mechanical Fasteners
- Elastomeric Paint



## 7-6 MH INSULATION: TOP FILL BLOW METHOD



- 1.** Drill or cut uniform access holes in the roof adequately spaced to access the entire roof cavity



- 2.** Blow insulation into attic cavity to capacity



- 3.** Run a continuous bead of flexible and durable all-weather adhesive around the access hole



- 4.** Install a durable metal patch of equal or greater gauge than the roof material that overlaps the opening at least 2 inches on all sides, and fastening in place every 2 inches along perimeter



- 5.** Apply elastomeric paint over patch that laps at least 6 inches on all sides to create a continuous seal

### NOTES

## 8-1 AIR SEAL ABOVE THE KNEE WALL

Aligns with SWS [3.0101.1](#), [3.0102.11](#)



### BEFORE

✗ Knee walls are part of the thermal and pressure boundary



### AFTER

✓ Air sealing from above continues the pressure boundary while supporting future insulation

### TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- Caulk Gun
- Spray Foam Gun

### MATERIALS

- Extruded Polystyrene (XPS)
- Plywood
- Gypsum Board
- Lumber
- Mechanical Fasteners
- Caulk
- Spray Foam
- Mastic

## 8-1 AIR SEAL ABOVE THE KNEE WALL



- 1.** After clearing away debris, measure gap above knee wall in line with pressure boundary



- 2.** Cut blocking material (XPS, wood, gypsum board) to fit gap



- 3.** Securely fit infill or blocking material in place



- 4.** Ensure blocking material is located in line with preferred pressure boundary

### NOTES



## 8-1 AIR SEAL ABOVE THE KNEE WALL



- 5.** Secure in place with mechanical fasteners or adhesive as necessary to prevent movement when insulation is installed



- 6.** Seal continuously around blocking material to preserve pressure boundary

### NOTES

## 8-2 AIR SEAL BENEATH THE KNEE WALL

Aligns with SWS 3.0101.1



### BEFORE

✗ Knee walls are part of the thermal and pressure boundary



### AFTER

✓ Air sealing from below allows areas of the attic floor to be treated separately according to whether they fall in or out of the pressure boundary

### TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- Caulk Gun
- Spray Foam Gun

### MATERIALS

- Extruded Polystyrene (XPS)
- Plywood
- Gypsum Board
- Lumber
- Mechanical Fasteners
- Caulk
- Spray Foam
- Mastic

## 8-2 AIR SEAL BENEATH THE KNEE WALL



**1.** After clearing away debris, measure gap below knee wall in line with pressure boundary



**2.** Cut blocking material (XPS, wood, gypsum board) to fit gap



**3.** Securely fit infill or blocking material in place



**4.** Ensure blocking material is located in line with preferred pressure boundary



**5.** Seal continuously around blocking material to preserve pressure boundary

### NOTES



## 8-3 INSULATE AN ATTIC KNEE WALL WITH BATTS

Aligns with SWS [4.0104.2](#), [4.0104.3](#)



### BEFORE

✗ Air sealed knee walls are ready for insulation



### AFTER

✓ Once insulated, this knee wall provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement

### TOOLS

- Measuring Tape
- Utility Knife
- Staple Gun

### MATERIALS

- Fiberglass Batts
- Staples
- Nylon Strap
- Mechanical Fasteners
- House Wrap
- Radiant Barrier

## 8-3 INSULATE AN ATTIC KNEE WALL WITH BATTS



**1.** Measure cavities



**2.** Cut batts for exact fit



**3.** Install batts with minimal compression



**4.** Install backing material

### NOTES

## 8-4 INSULATE AN ATTIC KNEE WALL WITH 2-PART SPRAY FOAM

Aligns with SWS [4.0104.5](#), [4.0104.6](#)



### BEFORE

- ✗ Air seal before applying spray foam to prevent foam from leaking into conditioned space



### AFTER

- ✓ Spray walls as evenly as possible

### TOOLS

- Spray Foam Gun
- Fit-Tested Respirator or PAPR
- Measuring Tape
- Utility Knife
- Drill

### MATERIALS

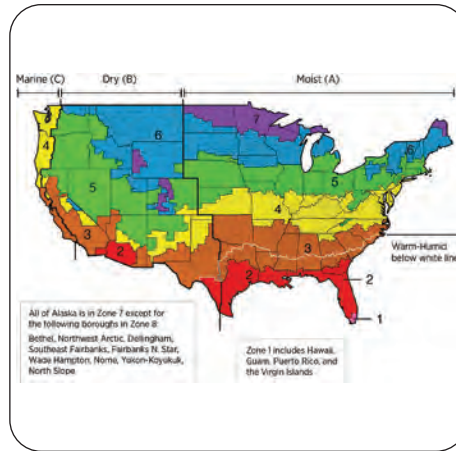
- 2-Part Spray Foam
- Low-Perm Paint
- Polyisocyanurate
- Expanded Polystyrene (EPS)
- Gypsum Board
- Mechanical Fasteners
- Joint Tape
- Joint Compound



## 8-4 INSULATE AN ATTIC KNEE WALL WITH 2-PART SPRAY FOAM



Ensure proper PPE when installing 2-Part Spray Foam



For climate zones 5-8, install foam to a thickness of at least a class II vapor retarder or install a class II vapor retarder, such as fiber-faced polyiso, unfaced EPS or low-perm paint

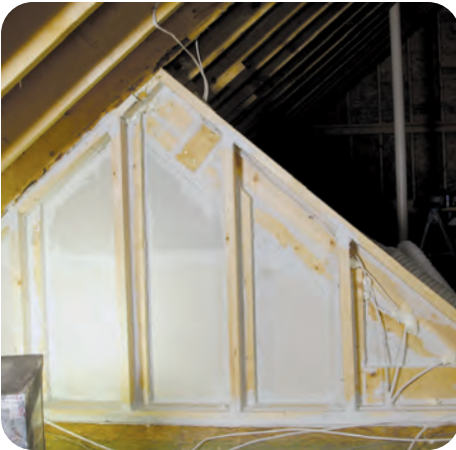


If space is used for utility access, storage, or permanently habitable, separate foam from the subspace with a suitable thermal barrier covering, such as 1/2-inch gypsum board

### NOTES

## 8-5 INSULATE AN ATTIC KNEE WALL WITH BLOWN INSULATION

Aligns with SWS 4.0104.1



### BEFORE

✗ Air sealed knee walls are ready for insulation



### AFTER

✓ Once insulated, this knee wall provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement

### TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Staple Gun
- Hole Saw
- Insulation Machine

### MATERIALS

- Extruded Polystyrene (XPS)
- Gypsum Board
- House Wrap
- Radiant Barrier
- Mechanical Fasteners
- Furring Strips
- Loose Fiberglass Insulation

## 8-5 INSULATE AN ATTIC KNEE WALL WITH BLOWN INSULATION



- 1.** Securely install backing material over entire knee wall



- 2.** Cut holes in backing material to allow access to all cavities



- 3.** Blow insulation into cavities to meet dense-pack standards



- 4.** Fill all cavities



- 5.** Replace access hole plugs in backing material, if possible



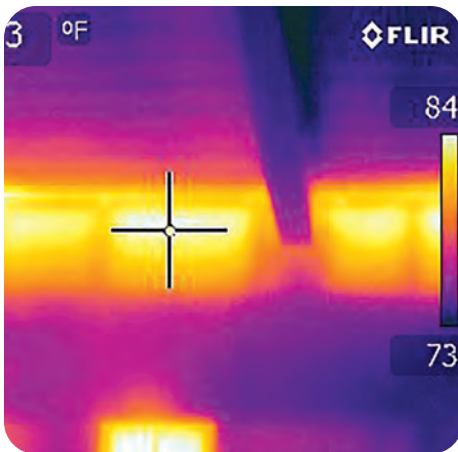
- 6.** Seal access holes permanently and completely

### NOTES



# 9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW

Aligns with SWS 4.0202.1



## BEFORE

✗ Walls that are missing insulation or underinsulated are an opportunity for energy savings



## AFTER

✓ When properly insulated, walls will allow minimal heat and air transfer

## TOOLS

- Measuring Tape
- Utility Knife
- Pry-Bar
- Siding Remover
- Hole Saw
- Drill
- Insulation Machine

## MATERIALS

- Plastic Sheeting
- Painters Tape
- Loose Cellulose or Fiberglass Insulation
- Plugs
- Caulk
- Spray Foam
- Mechanical Fasteners

## 9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW



- 1.** Protect work area from debris and dirt



- 2.** Ensure balloon-framed walls are blocked at top and bottom



- 3.** Ensure wall integrity is complete (no holes)



- 4.** Remove siding as needed



- 5.** Drill holes as required based on building frame design and exterior materials



- 6.** Fill cavities completely and to proper density

## 9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW



**7.** If possible, ensure all cavities are filled before completing job



**8.** Patch holes



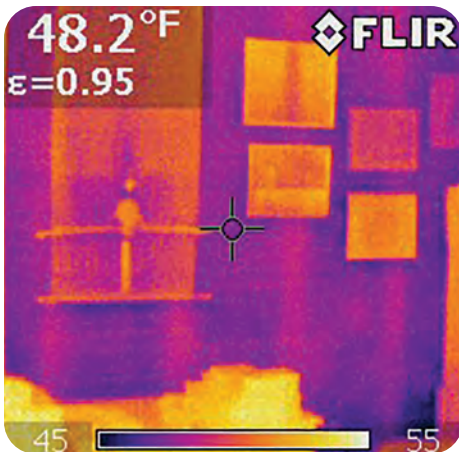
**9.** Replace or repair siding

### NOTES



## 9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW

Aligns with SWS 4.0202.1



### BEFORE

✗ Older houses often are lacking in insulation



### AFTER

✓ Patch access holes to match original interior surface characteristics or cover with trim

### TOOLS

- Measuring Tape
- Utility Knife
- Hole Saw
- Drill
- Insulation Machine
- Infrared Camera

### MATERIALS

- Plastic Sheeting
- Loose Cellulose or Fiberglass Insulation
- Gypsum Board
- Joint Compound
- Caulk
- Mechanical Fasteners
- Chair Rail
- Plugs
- Painters Tape

## 9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW



- 1.** Protect work area from debris and dust



- 2.** Ensure balloon-framed walls are blocked at top and bottom



- 3.** Ensure wall integrity is complete (no holes)



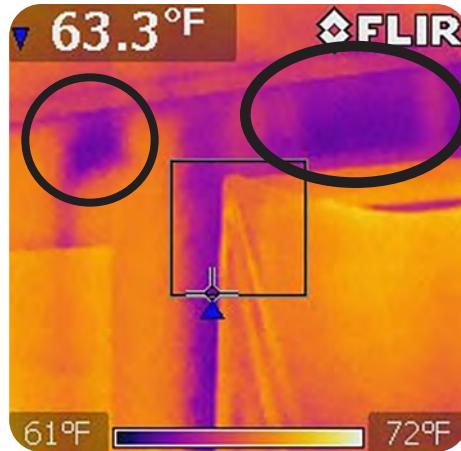
- 4.** Drill holes as required based on building design

### NOTES

## 9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW



**5.** Fill cavities completely and to proper density



**6.** If possible, ensure all cavities are filled before completing job (Note: Dark areas were missed)



**7.** Patch holes. Use chair rail if preferred.

### NOTES



# 10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS

Aligns with SWS 4.0202.3



## BEFORE

✗ Manufactured housing sidewalls present a unique challenge when it comes to insulation



## AFTER

✓ Properly installed insulation will have no gaps and compressed as little as possible

## TOOLS

- Drill
- Measuring Tape
- Utility Knife
- Batt Stuffer

## BEFORE YOU BEGIN



Prepare insulation stuffer, if necessary

## MATERIALS

- Wrapped Fiberglass Batts
- Mechanical Fasteners

## 10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS



**1.** Remove siding as needed, starting from bottom and taking note of any obstacles that may compress insulation



**2.** Measure cavity size



**3.** Plastic-wrapped fiberglass batts provide both insulation value and vapor retarder for unsealed cavities



**4.** Cut batt to length for cavity



**5.** Fold batt over end of insulation stuffer



**6.** Insert batt into cavity, sliding under top belt rail to top of cavity, and ease stuffer back out to allow batt to fill in space

## 10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS



- 7.** Gently tug batt into place and tuck remaining batt under lower belt rail and fit down to bottom of cavity with minimal compression



- 8.** Reinstall siding



- 9.** Reattach mechanical fasteners

### NOTES



# 10-2 INSULATE MANUFACTURED HOME SIDEWALLS WITH BLOWN INSULATION

Aligns with SWS 4.0202.4, 4.0202.5



## BEFORE

✗ Older manufactured housing is often lacking insulation since it did not have to be built to a particular jurisdiction's codes



## AFTER

✓ When properly insulated, siding will not bulge or be dented from installation

## TOOLS

- Drill
- Insulation Machine

## MATERIALS

- Loose Fiberglass Insulation
- Mechanical Fasteners

## 10-2 INSULATE MANUFACTURED HOME SIDEWALLS WITH BLOWN INSULATION



**1.** Ensure the integrity of the wall to be insulated, both from the exterior and interior



**2.** Remove siding as needed, from the bottom



**3.** Fill cavity with blown insulation, ensuring to get past belt rails and electrical



**4.** Reinstall siding



**5.** Be prepared to adapt insulation strategy dependent upon exterior materials

### NOTES

# 11-1 INSTALL WEATHERSTRIPPING ON AN EXTERIOR DOOR

Aligns with SWS 3.0202.1



## BEFORE

**X** Daylight visible  
around an exterior door  
indicates air infiltration



## AFTER

### FINAL CHECKLIST

- ✓ Door closes and opens easily
- ✓ Weatherstrip makes a good seal with the door
- ✓ Weatherstrip does not get flattened in a way that will lead to damage when used

## TOOLS

- Tape Measure
- Snips
- Drill with  
Appropriate Bits

## MATERIALS

- Weatherstripping



## 11-1 INSTALL WEATHERSTRIPPING ON AN EXTERIOR DOOR



- 1.** Measure doorway for weatherstripping



- 2.** Measure door top or bottom as well for weatherstripping and potential door bottom or sweep



- 3.** Notch upper ends of side weatherstripping to allow for top piece



- 4.** Fit weatherstripping snugly into rabbet, if one exists, and against other pieces



- 5.** Fasten weatherstripping securely when no rabbet exists

### NOTES

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## 11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

Aligns with SWS [3.0202.1](#)



### BEFORE

✗ Air and water can come in under doors when there is no door bottom or sweep



### AFTER

#### FINAL CHECKLIST

- ✓ Ensure a good seal to prevent air infiltration
- ✓ Ensure unimpeded door operation

### TOOLS

- Measuring Tape
- Metal Snips
- Saw
- Drill
- Caulk Gun

### MATERIALS

- Mechanical Fasteners
- Caulk

### NOTES

Door bottoms commonly are installed on new doors, those that have wooden thresholds, or to replace older existing door bottoms. For houses with a rubber threshold, door sweeps are more common.

## 11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

### STEPS 1-3: FOR DOOR SWEEP AND DOOR BOTTOM



**1.** Measure width of door and ensure that door sweep is appropriate length



**2.** Adjust threshold to ensure it is seated tightly



**3.** Apply caulk to threshold at floor on interior, and exterior if possible, to minimize water intrusion

### STEPS 4-6: FOR DOOR SWEEP



**4.** Install door sweep on interior face of door, centering on door face



**5.** Attach door sweep using mechanical fasteners



**6.** Evenly place mechanical fasteners along entire length of door sweep



## 11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

### STEPS 4-8: FOR DOOR BOTTOM



- 4.** With threshold adjusted, measure door opening height



- 5.** Remove door from opening if height of door needs to be shortened to make room for door bottom



- 6.** Trim door, if possible, to ensure good fit of door bottom



- 7.** Trim sweep to match width of door



- 8.** Ensure door bottom sits tight against the door and reinstall door

### NOTES

## 12-1 AIR SEAL SILL PLATE AND RIM JOIST

Aligns with SWS 3.0104.1



### BEFORE

✗ Air movement around sill plates and near rim joists needs to be addressed before insulating



### AFTER

✓ Once air sealed, the cavity is ready for insulation

### TOOLS

- Spray Foam Applicator
- Spray Foam Gun
- Caulk Gun

### NOTES

### MATERIALS

- 2-Part Spray Foam
- 1-Part Spray Foam
- Backer Rod
- Machine Mesh
- Steel Wool
- Caulk



## 12-1 AIR SEAL SILL PLATE AND RIM JOIST



- 1.** For exterior holes larger than 1/4 inch, steel wool or other pest blocking material before sealing



- 2.** Cut backing material to fill space



- 3.** Seal over to hold backing material in place and air seal



- 4.** Seal penetrations on subfloor as well, looking out not only for current electrical and plumbing, but also vacated holes



- 5.** Push sealant into seams where framing members meet



- 6.** Create a continuous seal on all seams



## 12-2 INSULATE RIM JOIST

Aligns with SWS [4.0401.1](#), [4.0401.2](#), [4.0401.3](#)



### BEFORE

✗ Basement and crawlspace rim joists must be addressed when part of the thermal boundary



### AFTER

✓ Foam products thicker than 3.25 inches require a thermal barrier or coating, such as 1/2-inch gypsum board, to separate them from permanently habitable spaces

### TOOLS

- Measuring Tape
- Utility Knife
- Spray Foam Applicator
- Spray Foam Gun
- Drill
- Caulk Gun

### MATERIALS

- Polyisocyanurate Foam Board
- Plastic-Wrapped Fiberglass Batts
- Extruded Polystyrene (XPS)
- 2-Part Spray Foam
- 1-Part Spray Foam
- Gypsum Board
- Mechanical Fasteners
- Caulk

## 12-2 INSULATE RIM JOIST



1. Measure each individual cavity to be insulated and take note of obstacles for insulation



2. Cut insulation, either rigid foam board or wrapped batts, for each individual cavity



3. Ensure space is filled with no gaps or misalignment, and insulation tight to rim joist



4. Ensure insulation is secured in place and will not move over time

### NOTES

As long as foam is not over 3.25 inches thick and space is not permanently habitable, insulation does not need to be covered by thermal barrier

## 12-2 INSULATE RIM JOIST



- 5.** If foam insulation is over 3.25 inches thick or space is permanently habitable, insulation needs to be covered by a thermal barrier, such as gypsum board



- 6.** When using wrapped or faced batts, ensure facing is to the conditioned side of the cavity and that batt is uncompressed



- 7.** Seal edges of the wrap or facing to surrounding surface to ensure a continuous barrier



- 8.** A 2-part sprayfoam can also be used as rim joist insulation

### NOTES



# 12-3 INSULATE BASEMENT WALLS IN CONDITIONED SPACE

Aligns with SWS 4.0402.4, 4.0402.5



## BEFORE

- ✗ An uninsulated wall in a "conditioned" space allows the loss of conditioned air



## AFTER

- ✓ A sealed continuous air barrier finishes off an insulated basement wall, providing air sealing and thermal comfort

## TOOLS

- Caulk Gun
- Spray Foam Gun
- Metal Snips
- Measuring Tape
- Utility Knife
- Drill
- Staple Gun
- Taping Knife
- Mudding Trowel

## MATERIALS

- |                                |                              |                  |
|--------------------------------|------------------------------|------------------|
| • Backer Rod                   | • Extruded Polystyrene (XPS) | • Joint Compound |
| • Metal Lath                   | • Staples                    | • Joint Tape     |
| • Spray Foam                   | • Gypsum Board               |                  |
| • Caulk                        | • Luan                       |                  |
| • Fiberglass Kraft-Faced Batts | • Mechanical Fasteners       |                  |

## 12-3 INSULATE BASEMENT WALLS IN CONDITIONED SPACE



**1.** Check wall for penetrations and seal as needed



**2.** Check wall for water intrusion that needs to be mitigated first. All bulk sources of moisture should be directed away from the foundation walls



**3.** If insulation has vapor retarder on only one side, install it facing the conditioned space



**4.** Install insulation to prescribed R-value in full contact with the entire perimeter of foundation wall from ceiling to floor



**5.** Install a sealed air barrier on the conditioned side of the insulation. When using foam, gypsum board must be at least 1/2 inch to meet building codes for a thermal barrier

### NOTES

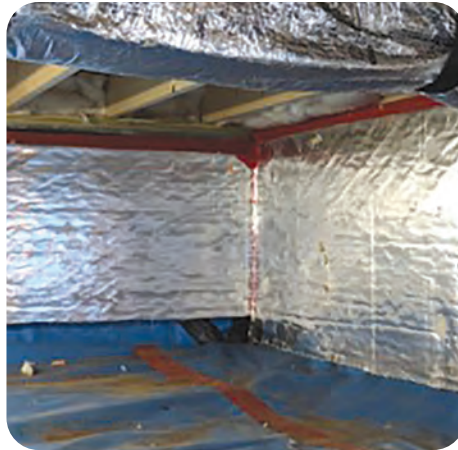
# 12-4 INSULATE CONDITIONED CRAWLSPACE WALL

Aligns with SWS 4.0402.2, 4.0402.3



## BEFORE

**X** Unvented crawlspaces are sometimes considered to be part of the conditioned space, so the walls need insulation



## AFTER

### FINAL CHECKLIST

- ✓ Insulation is or has class II vapor retarder
- ✓ Vapor retarder faces conditioned space
- ✓ Insulation laps underneath ground vapor retarder at foundation wall

## TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Spray Foam Gun
- Half- or Full-Face Respirator

## MATERIALS

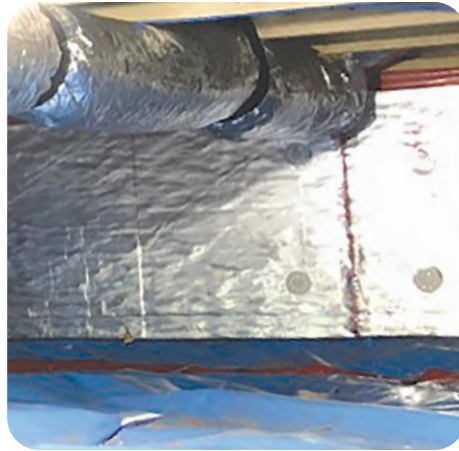
- Polyisocyanurate Foam Board
- Nylon Fasteners
- 2-Part Spray Foam



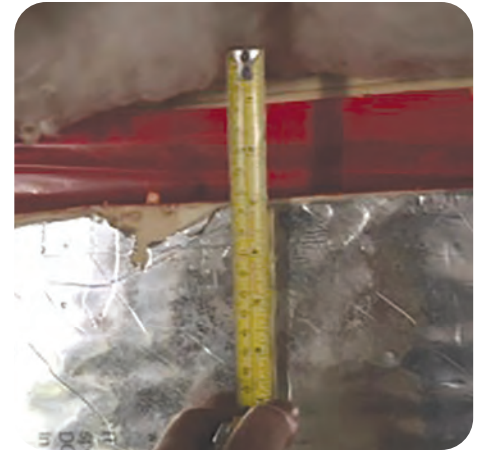
## 12-4 INSULATE CONDITIONED CRAWLSPACE WALL



**1.** Use a fire-rated material



**2.** Attach insulation in a durable manner



**3.** Leave a 3-inch termite inspection gap between the bottom of the sill plate at the top of the insulation, if needed

### NOTES

# 13-1 AIR SEAL SMALL PENETRATIONS IN A SUBFLOOR

Aligns with SWS 3.0101.1, 3.0104.1



Many types of caulks and sealants will easily span and seal a 1/4-inch gap



One-part spray foams can also span up to 3 inches to create an air seal

## TOOLS

- Caulk Gun
- Spray Foam Gun
- Utility Knife

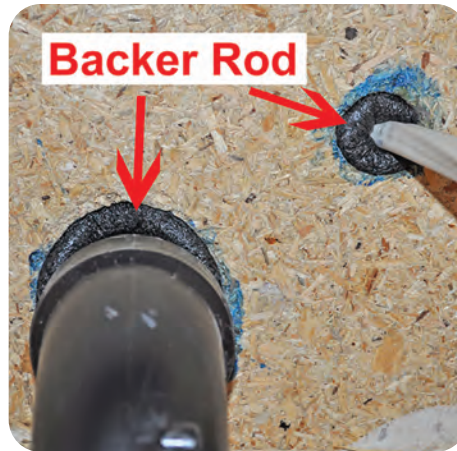
## MATERIALS

- Caulk Sealant
- One-Part Spray Foam
- Backer Rod

## 13-1 AIR SEAL SMALL PENETRATIONS IN A SUBFLOOR



- 1.** For small penetrations, caulk or sealant is often enough to seal the gap



- 2.** Use a backer rod or other infill material when sealing a gap larger than 1/4 inch with caulk



- 3.** Seal over the backer rod to establish the air seal



- 4.** Spray foam can also be used in areas with slightly larger penetrations

### NOTES



## 13-2 AIR SEAL LARGE PENETRATIONS IN A SUBFLOOR

Aligns with SWS 3.0101.1, 3.0104.1



### BEFORE

- ✗ Larger penetrations in the subfloor, especially plumbing chases, need to be air sealed



### AFTER

- ✓ Depending on the size of the gap, one-part spray foam or a combination of infill material and foam or caulk can be used

### TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Spray Foam Gun
- Caulk Gun

### MATERIALS

- One-Part Spray Foam
- Two-Part Spray Foam
- Caulk
- Extruded Polystyrene (XPS)
- Mechanical Fasteners

## 13-2 AIR SEAL LARGE PENETRATIONS IN A SUBFLOOR



- 1.** One-part spray foam expands to fill large holes, but needs support for holes over 5 inches



- 2.** For larger holes, rigid infill material is needed



- 3.** Cut rigid infill with attention to locations of pipes and electrical



- 4.** Secure rigid infill in place and seal smaller gaps around infill with appropriate materials



- 5.** Use appropriate materials for high-temperature locations, such as around flues and chimneys

### NOTES

## 13-3 AIR SEAL BALLOON FRAMING AT SUBFLOOR

Aligns with SWS 3.0101.1



### BEFORE

✗ Balloon-framed walls have an open cavity that runs from the basement to the attic, allowing for large amounts of air flow via stack effect



### AFTER

✓ Securely sealing off these cavities prevents air movement, as well as providing a barrier to hold in insulation and providing fire blocking

### TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- Spray Foam Gun
- Caulk Gun
- Chip Brush

### MATERIALS

- Extruded Polystyrene (XPS)
- Expanded Polystyrene (EPS)
- Gypsum Board
- Lumber
- Mechanical Fasteners
- 1-Part Spray Foam
- 2-Part Spray Foam
- Caulk
- Mastic



## 13-3 AIR SEAL BALLOON FRAMING AT SUBFLOOR



**1.** Measure opening



**2.** Cut blocking material to fit



**3.** Seal all edges with caulk, foam or mastic

### NOTES

Spray foam will not be used in spaces that will be exposed to habitable living space

# 14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE

Aligns with SWS [4.0301.1](#), [4.0301.6](#), [4.0302.1](#)



## BEFORE

✗ Uninsulated, unconditioned spaces drive down the energy efficiency of HVAC systems



## AFTER

### FINAL CHECKLIST

- ✓ Vapor retarder faces warm side of floor
- ✓ Consistent cover across subfloor

## TOOLS

- Measuring Tape
- Utility Knife
- Drill

## MATERIALS

- Kraft-Faced Fiberglass Batts
- Strapping
- Netting
- Rigid Barrier Such as Extruded Polystyrene (XPS)
- Mechanical Fasteners

## 14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE



- 1.** Ensure air sealing is complete



- 2.** Insulation R-value matches work order



- 3.** Batt vapor retarder faces warm side of floor



- 4.** Batts installed with no gaps

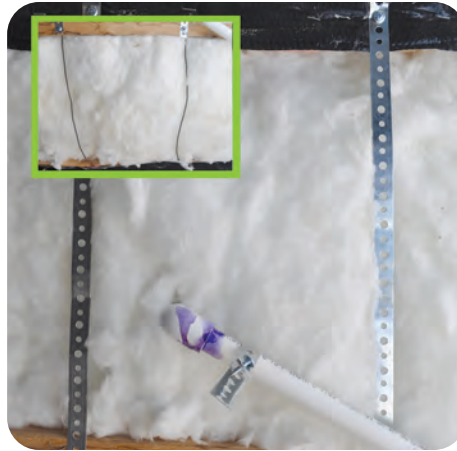
### NOTES



## 14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE



- 5.** Batts are in good contact with subfloor



- 6.** Batts held in place with physical fasteners, with minimal compression



- 7.** In areas where exposure to outside elements or vermin may be a concern, such as cantilevered or exposed floors, a rigid barrier is an extra layer of protection

### NOTES

# 14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE

Aligns with SWS [4.0301.2](#), [4.0301.3](#), [4.0301.4](#), [4.302.2](#), [4.0302.3](#)

## BEFORE YOU BEGIN



Uninsulated, unconditioned spaces drive down the energy efficiency of HVAC systems

### Description /Comment

Floor Insulation - Loose-fill + Rigid Barrier - R-19

Floor Insulation - Loose-fill + Rigid Barrier - R-19

Floor Insulation - Loose-fill + Rigid Barrier - R-19

- ✓ Review work order to verify if dense-pack or loose fill is required. Netting a subfloor will mean loose fill, but a rigid barrier can mean either

## TOOLS

- Measuring Tape
- Utility Knife
- Scissors
- Caulk Gun
- Insulation Machine
- Pressure Gauge
- Hole Saw

## MATERIALS

- Netting
- Rigid Barrier  
Such as Extruded Polystyrene (XPS)
- Staples
- Mechanical Fasteners
- Caulk
- Cellulose or Fiberglass Loose Insulation

## 14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE



**1.** Verify all air sealing and prep work is complete



**2.** Attach rigid barrier to cover entire cavity



**3.** Seal seams between sheets of rigid material to prevent air movement and insulation leakage



**4.** Cut an access hole into each cavity of the floor, large enough for fill tube



**5.** Use appropriate fill tube to correspond with work order requirements



**6.** Fill cavity completely to density required by work order



## 14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE



- 7.** Plug access hole either with original material cut out or appropriate replacement



- 8.** Seal around plug to keep it secure and air tight



- 9.** For work orders that require netting, secure a smooth layer of netting across the bottom of floor joists



- 10.** Keep staples close together



- 11.** Cover the entire cavity to ensure continuous insulation coverage and prevent insulation from blowing out the ends

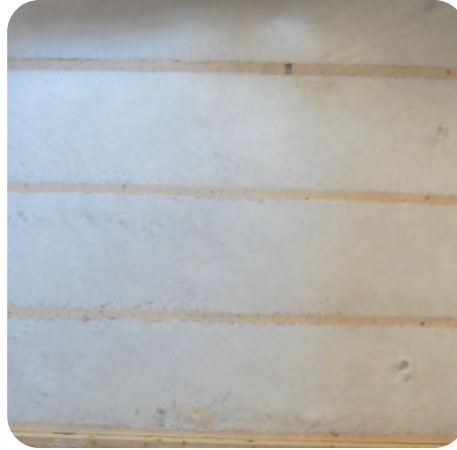


- 12.** Cut access hole for fill tube

## 14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE



**13.** Loose fill netting to required density



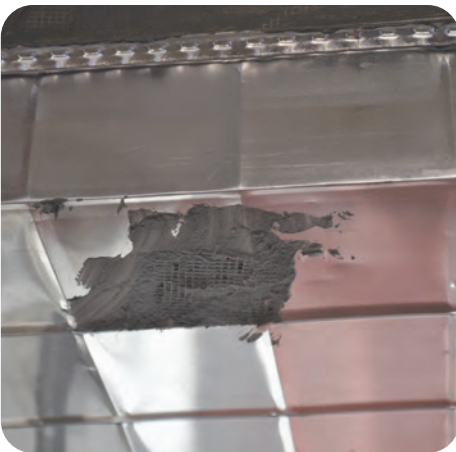
**14.** Ensure insulation coverage is even and continuous throughout floor cavities

### NOTES

# 15-1 INSULATE A MANUFACTURED HOME BELLY

Aligns with SWS 4.0302.9, 4.0302.1, (3.0102.5,  
3.0102.6, 3.0102.7)

## BEFORE YOU BEGIN



### CHECKLIST

- ✓ Air and duct sealing complete
- ✓ Electrical/plumbing issues fixed
- ✓ Belly board repaired/replaced

## TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Insulation Machine
- Pressure Gauge
- Saw

## MATERIALS

- Belly Wrap
- Belly Board
- Caulk
- Mechanical Fasteners
- Mastic
- Spray Foam
- Extruded Polystyrene (XPS)



## 15-1 INSULATE A MANUFACTURED HOME BELLY



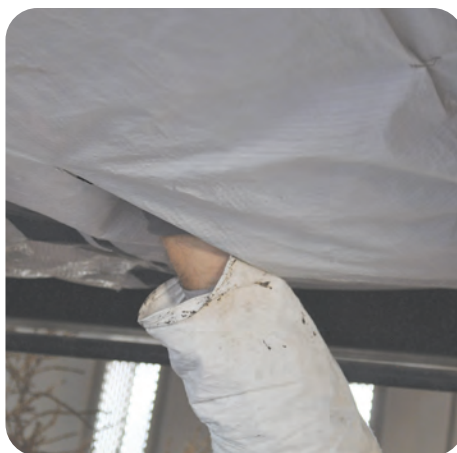
**1.** Remove old insulation and make repairs as needed



**2.** Attach new belly wrap



**3.** Seal seams of belly wrap



**4.** Cut access holes to ensure entire cavity will receive continuous and consistent insulation

### NOTES

## 15-1 INSULATE A MANUFACTURED HOME BELLY



**5.** Fill entire belly cavity to prescribed R-value



**6.** Apply waterproof, permanent adhesive to patch for belly wrap, with patch sized at least 3 inches larger than hole in barrier



**7.** Stitch staple patch to ensure permanent adhesion

### NOTES

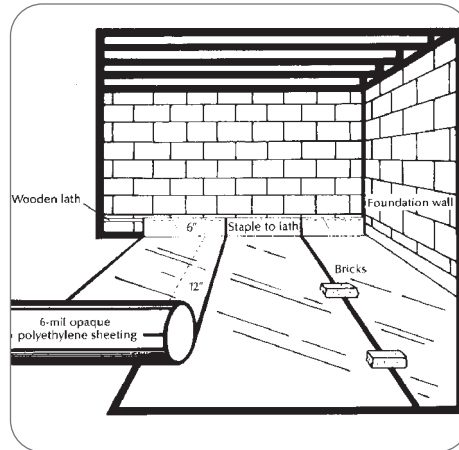
# 16-1 INSTALL A CRAWLSPACE VAPOR RETARDER

Aligns with SWS 2.0202.1, 2.0202.2, 2.0202.3, (3.0104.1)



## BEFORE

- ✗ Moisture and resultant mold issues in crawlspaces can cause extensive damage to floor assemblies and foundations



## AFTER

- ✓ A well-installed vapor retarder helps to minimize ground moisture vapor and soil gas, such as radon

## TOOLS

- Utility Knife
- Measuring Tape
- Caulk Gun

## MATERIALS

- 6-Mil Plastic Sheeting
- Durable Adhesive Tape
- Furring Strips
- Mechanical Fasteners
- Ballast
- Sealant



## 16-1 INSTALL A CRAWLSPACE VAPOR RETARDER



**1.** Clear out storage and debris



**2.** Select appropriate materials



**3.** Spread out plastic as flat as possible



**4.** Extend plastic a minimum of 6 inches up walls, piers and columns

### NOTES

## 16-1 INSTALL A CRAWLSPACE VAPOR RETARDER



**5.** Use a minimum 12 inches reverse shingle overlap and tape seams



**6.** Plastic needs to be fastened in durable way: e.g., tape, sealant, screws



**7.** Use ballast to hold down vapor retarder

### NOTES

## 16-2 REPAIR AN EXISTING CRAWLSPACE VAPOR RETARDER

Aligns with SWS [2.0202.1](#), [2.0202.2](#), [2.0202.3](#), ([3.0104.1](#))



### BEFORE

**X** Improperly installed and damaged vapor retarders do not prevent moisture and resultant mold issues in crawlspace



### AFTER

**✓** A well-installed vapor retarder helps to minimize ground moisture vapor and soil gas, such as radon

### TOOLS

- Utility Knife
- Measuring Tape
- Caulk Gun

### MATERIALS

- 6-Mil Plastic Sheeting
- Durable Adhesive Tape
- Furring Strips
- Mechanical Fasteners
- Ballast
- Sealant



## 16-2 REPAIR AN EXISTING CRAWLSPACE VAPOR RETARDER



**1.** When repairing along the ground, ensure seams overlap uphill in a reverse shingle pattern



**2.** Overlap seams by at least 12 inches



**3.** Spread out plastic as flat as possible



**4.** Plastic needs to be fastened in durable way: e.g., tape, sealant



**5.** Ensure plastic extends a minimum of 6 inches up walls, piers and columns and is securely attached

### NOTES

# 17-1 VENT A CLOTHES DRYER

Aligns with SWS [6.0101.1](#), [6.0101.2](#), [6.0202.1](#)



## BEFORE

- ✗ Dryer vents with long bumpy runs create a fire hazard



## AFTER

- ✓ When properly vented, dryers run more efficiently, are safer and last longer

## TOOLS

- Metal Snips or Grinder
- Flathead Screwdriver
- Utility Knife

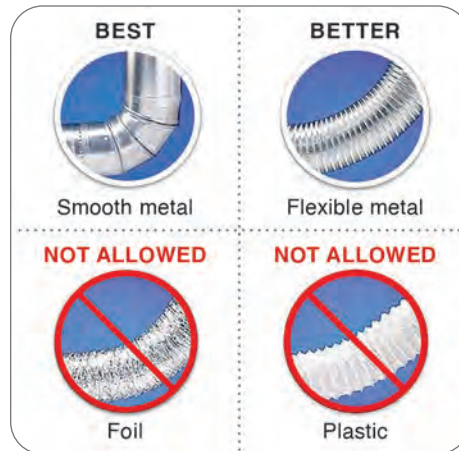
## MATERIALS

- 28-Gauge Rigid or Semi-Rigid Metal Ducting
- Worm-Drive Clamps
- Backdraft Damper
- Duct Insulation
- Foil Tape

## 17-1 VENT A CLOTHES DRYER



1. Keep duct run as short as possible to prevent backup of lint



2. Duct material is metal rigid or semi-rigid



3. Correct fasteners are used (no screws penetrating into duct)



4. Duct terminates to outside, at a downward slope when possible

### NOTES



## 17-1 VENT A CLOTHES DRYER



**5.** Termination has backdraft damper and no cage



**6.** Duct in uninsulated space is insulated



**7.** If duct run must exceed 35 feet, install booster fan

### NOTES

# 18-1 INSTALL EXHAUST FAN FLEX DUCT (BATH FAN ONLY)

Aligns with SWS [6.0101.1](#), [6.0101.2](#), [6.0201.1](#)



## BEFORE

✗ Exhausting moisture from bath fans into the attic or crawlspace can cause mold and rot in building materials



## AFTER

✓ Bath fans must exhaust to the exterior of the home

## TOOLS

- Measuring Tape
- Utility Knife
- Zip Tie Tensioner
- Drill

## MATERIALS

- Flex Ducting with R-8 Insulation (unless ducting will be buried in insulation)
- Zip Ties
- Support Strapping
- Mechanical Fasteners

## 18-1 INSTALL EXHAUST FAN FLEX DUCT (BATH FAN ONLY)



**1.** Ensure proper connection of duct to bath fan



**2.** Ensure flex ducting runs smoothly with no kinks or u-turns



**3.** Create the shortest run possible to an exterior termination and provide adequate support as needed without compressing the duct

### NOTES



## 18-2 INSTALL A HARD-DUCTED EXHAUST VENT

Aligns with SWS [6.0101.1](#), [6.0101.2](#), [6.0201.1](#), [6.0201.2](#)



### BEFORE

- ✗ Kitchens and bathrooms must be ventilated to control moisture, vapor, and combustion gases

### TOOLS

- Measuring Tape
- Hole Saw
- Drill
- Caulk Gun

### AFTER

#### KITCHEN CHECKLIST

- ✓ Located within 5 feet of primary cooking surface
- ✓ At least 100 cfm but not more than 3 sones
- ✓ Efficacy of 2.8 cfm/watt or more

#### BATHROOM CHECKLIST

- ✓ Located in center of room
- ✓ At least 50 cfm but not more than 2 sones
- ✓ Efficacy of 4 cfm/watt or more

### MATERIALS

- Mastic
- Brush
- Foil Tape
- Duct Insulation
- 28-Gauge Ducting
- Vent Termination
- Caulk

## 18-2 INSTALL A HARD-DUCTED EXHAUST VENT



1. Fasten rigid duct using three equally spaced screws



2. Keep duct run as short as possible with few turns, and run to exterior – either via roof or sidewall



3. Seal all joints with mesh and mastic or foil tape



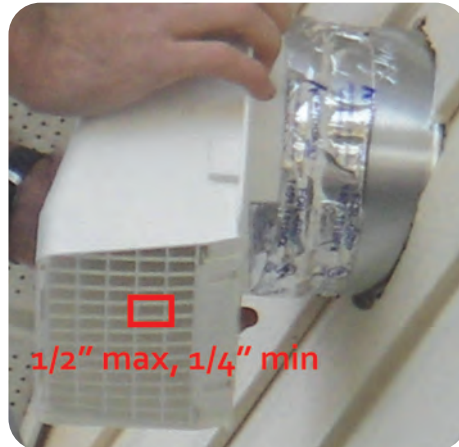
4. Completely seal joints

### NOTES

## 18-2 INSTALL A HARD-DUCTED EXHAUST VENT



**5.** Locate exterior vent based on duct run and size hole less than 1/2 inch larger than duct



**6.** Chose appropriate exterior termination to match size of duct while minimizing water intrusion and pest infestation. Seal around exterior termination as needed



**7.** Ducting that runs through unconditioned space will be insulated to R-8

### NOTES



# 19-1 SEAL DUCTS WITH MASTIC

Aligns with SWS [5.0106.1](#), [6.0101.2](#), [6.0101.3](#), ([5.0105.1](#), [5.0105.2](#), [5.0105.3](#))



## CHECKLIST

- ✓ Ensure ducts are properly connected
- ✓ Ensure ducts are properly supported

## TOOLS

- Drill
- Zip Tie Tensioner
- Caulk Gun

## MATERIALS

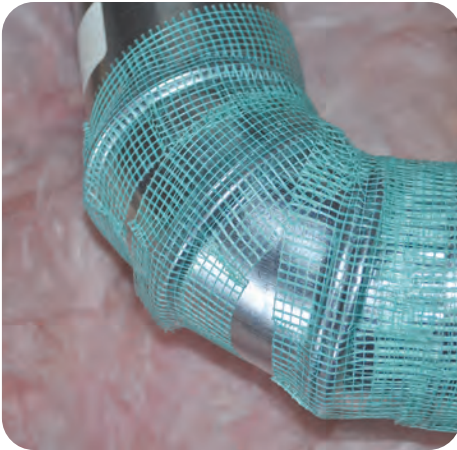
- Mastic
- Fiberglass Mesh Tape
- Chip Brush
- Mechanical Fasteners
- 26-Gauge Metal Sheeting
- Duct or Electrical Tape (for temporary use)
- Flexible Caulking
- Butyl Tape

## NOTES

Mastic alone can be used for gaps <1/8-inch, when gap is located more than 10 inches from air handler and static pressure is less than 1 iwc

## 19-1 SEAL DUCTS WITH MASTIC

**METHOD A - FOR SMALL GAPS (LESS THAN 1/4 INCH)  
INCLUDING ALL JOINTS, SEAMS, AND CRACKS IN DUCT SYSTEM**



**A-1.** Apply fiberglass mesh tape over all gaps, seams, joints, etc.

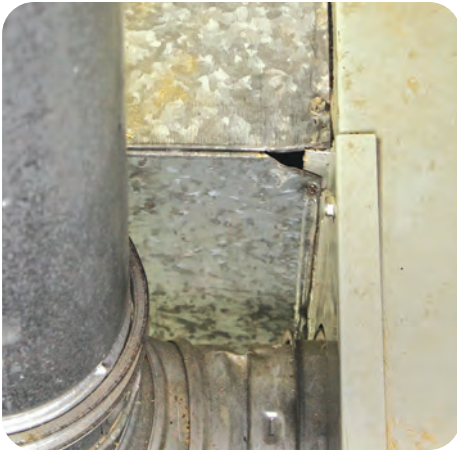


**A-2.** Apply mastic over all mesh tape and all gaps, seams, joints, etc.

### NOTES

## 19-1 SEAL DUCTS WITH MASTIC

### METHOD B - FOR MEDIUM GAPS (1/4-3/4 INCH) SUCH AS MINOR HOLES AND PENETRATIONS IN DUCT SYSTEM



**B-1.** Small holes and penetrations require one additional step



**B-2.** Apply temporary tape as a backer to hold mastic



**B-3.** Apply mastic over the tape



**B-4.** Push fiberglass mesh into the mastic



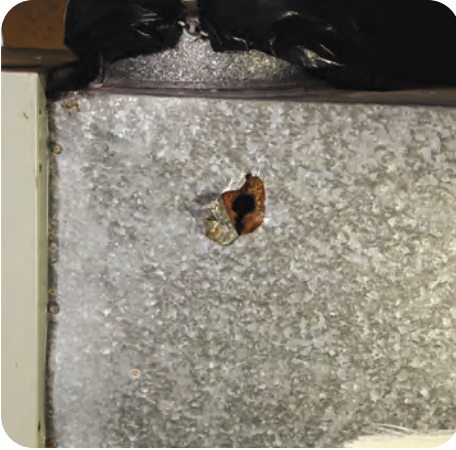
**B-5.** Apply additional mastic over mesh and tape, extending at least 1 inch past edges of tape in all directions

#### NOTES

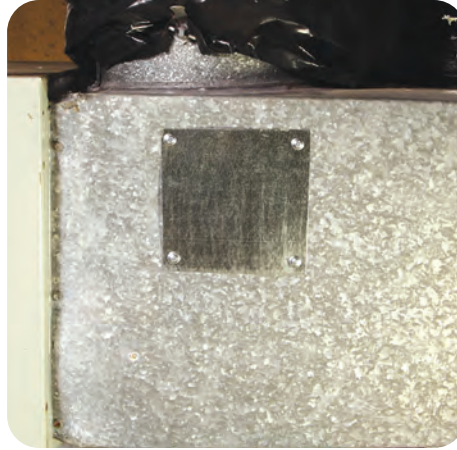


## 19-1 SEAL DUCTS WITH MASTIC

### METHOD C - FOR LARGER GAPS OR HOLES (OVER 3/4 INCH)



**C-1.** Larger holes require a different process



**C-2.** Cut patch that will extend over entire gap or hole and affix with mechanical fasteners



**C-3.** Apply mastic over edges and fasteners of patch and push fiberglass mesh into it



**C-4.** Apply additional mastic over mesh, extending at least 1 inch past tape and seam in all directions

#### NOTES

## METHOD D - FOR CONNECTIONS BETWEEN DUCT BOOT AND SURFACE



**D-2.** Clean the area around the duct boot to allow for better adhesion of fiberglass mesh tape



**D-4.** Apply mastic over mesh tape and allow to dry completely before reinstalling register

## NOTES

[illegible]

# 19-1 SEAL DUCTS WITH MASTIC

## METHOD E - AT THE AIR HANDLER



**E-1.** Ensure that filter slot cover is removable so occupant can change filter as needed, but does not allow for bypass air around air filter



**E-2.** Seal unnecessary holes in air handler cabinet with butyl tape

### NOTES



# 20-1 INSULATE HARD PIPE DUCTS

Aligns with SWS 5.0107.1, 5.0105.2, (6.0202.1)



## TOOLS

- Measuring Tape
- Utility Knife

## BEFORE YOU BEGIN

### VERIFY DUCTS ARE:

- ✓ Connected properly
- ✓ Supported properly
- ✓ Air-sealed properly

## AFTER

Well-supported and uniformly-insulated ducts perform at higher efficiency

## MATERIALS

- Duct Insulation (min R-8) with Exterior Vapor Retarder
- UL-181 Tape
- Twine
- Zip Ties

## 20-1 INSULATE HARD PIPE DUCTS



- 1.** Layer insulation around duct, fitting between duct and construction members as necessary and able



- 2.** Tape joints to secure insulation in place



- 3.** Insulation will not be compressed



- 4.** Tape around circumference of duct at regular intervals



- 5.** Twine or zip ties can also be used to offer additional support for insulation – but should not compress the insulation

### NOTES

## 20-2 INSULATE FLEX DUCTS

Aligns with SWS 5.0107.1, 5.0105.2



### TOOLS

- Measuring Tape
- Utility Knife
- Zip Tie Tensioner

### BEFORE YOU BEGIN

#### VERIFY DUCTS ARE:

- ✓ Connected properly
- ✓ Supported properly
- ✓ Air-sealed properly

### AFTER

Ducts in unconditioned spaces require a minimum R-8 insulation. If exposed to the exterior, R-12.

### MATERIALS

- Duct Insulation (min R-8) with Exterior Vapor Retarder
- UL-181 Tape
- Twine
- Zip Ties



## 20-2 INSULATE FLEX DUCTS



- 1.** Secure duct liner to hard connections with zip tie and tensioner tool



- 2.** Pull insulation over hard connections as needed



- 3.** Secure vapor retarder layer at boots



- 4.** Seal new joints

### NOTES

## 20-3 INSULATE SUPPLY BOOTS

Aligns with SWS [5.0107.1](#), [5.0107.2](#)



**X** Exposed duct boots are a prime location for energy loss



### BEFORE YOU BEGIN

Ensure ducts are:

- ✓ Properly connected
- ✓ Properly supported
- ✓ Properly air-sealed

### TOOLS

- Measuring Tape
- Utility Knife
- Zip Tie Tensioner

### MATERIALS

- R-8 Minimum Flex Duct insulation
- Duct Insulation with Vapor Retarder
- Water Heater Blanket with Vapor Retarder
- Zip Ties
- Twine
- Spray Adhesive
- Mastic
- UL 181 Fiberglass Mesh Tape

## 20-3 INSULATE SUPPLY BOOTS



**1.** Insulate all exposed metal of the boot



**2.** Ensure a complete vapor barrier by sealing all seams with mastic

### NOTES

- R-8 minimum for ducts in unconditioned spaces.
- R-12 minimum for ducts exposed to outside elements.



# 20-4 INSULATE PLENUM

Aligns with SWS 5.0107.1



## BEFORE

- ✗ Return and supply plenums left uninsulated with contact to unconditioned spaces allow for energy loss



## AFTER

### FINAL CHECKLIST

- ✓ Ducts are connected properly
- ✓ Ducts are supported properly
- ✓ Ducts are air-sealed properly

## TOOLS

- Measuring Tape
- Utility Knife

## MATERIALS

- R-8 Minimum Insulation in unconditioned spaces
- R-12 Minimum insulation if exposed to outside elements
- Spray Adhesive
- Twine
- Mechanical Fasteners
- Extruded Polystyrene
- Gypsum Board
- Mastic
- UL-181 Mesh Tape
- Butyl Tape

## 20-4 INSULATE PLENUM



1. Cover any unnecessary holes in the air handler cabinet



2. Check return cavities inside building envelope to ensure they are sealed off from unconditioned spaces



3. Patch holes in ducts and plenum with appropriate materials (see 19-1 Seal Ducts with Mastic)



4. Prepare plenum by removing any residue from old insulation

### NOTES

Expanded  
Polystyrene (EPS) is  
not appropriate for use  
in high-temperature  
areas - particularly  
inside framed  
return platforms

## 20-4 INSULATE PLENUM



- 5.** Measure insulation to take maximum advantage of large sheets of duct insulation



- 6.** Cut to size for area to be covered. Insulate all exposed metal of the plenum



- 7.** To ensure a complete vapor barrier, trim insulation from vapor barrier to create overlap flap for seams, or tape seams with UL-181 tape



- 8.** Ensure clean surface for adhesion at overlap seam

### NOTES



## 20-4 INSULATE PLENUM



- 9.** Spray adhesive over area where piece will be installed



- 10.** Ensure smooth and unrippled adhesion of insulation to metal of plenum



- 11.** Spray adhesive along vapor retarder at seam to seal closed



- 12.** Ensure overlapping flap securely adheres to the lower layer to maintain complete vapor barrier, or tape seams with UL-181 tape



- 13.** Support insulation to prevent movement over time, securing in place without puncturing vapor retarder

# 21-1 WINDOW INSTALLATION

Aligns with SWS 3.0201.9



## BEFORE

**X** Single pane aluminum-frame windows offer little to no thermal break from outdoors



## AFTER

### FINAL CHECKLIST

- ✓ Window opens and closes properly
- ✓ All exterior edges are air-sealed
- ✓ Water will flow away from window

## TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Spray Foam Gun
- Vacuum

## MATERIALS

- Plastic Sheeting
- Shims
- Flashing Tape
- Mechanical Fasteners
- Backer Rod
- Spray Foam

## 21-1 WINDOW INSTALLATION



**1.** Measure window to be replaced



**2.** Remove existing window



**3.** Clean up sash or jam and repair any issues



**4.** Replace flashing as needed



**5.** Dry fit window



**6.** Level the window using shims and secure with mechanical fasteners



## 21-1 WINDOW INSTALLATION



**7.** Ensure window is operational



**8.** Caulk all exterior edges



**9.** Insulate and seal rough opening with backer rod or spray foam



**10.** Replace trim

### NOTES

## 21-2 DOOR INSTALLATION

Aligns with SWS 3.0202.2



### BEFORE

**X** In rare cases, doors are too damaged to be retrofitted and must be replaced



### AFTER

#### FINAL CHECKLIST

- ✓ Weatherstrip and door bottom installed
- ✓ Door opens and closes properly
- ✓ All exterior trim is caulked
- ✓ Water will flow away from the door

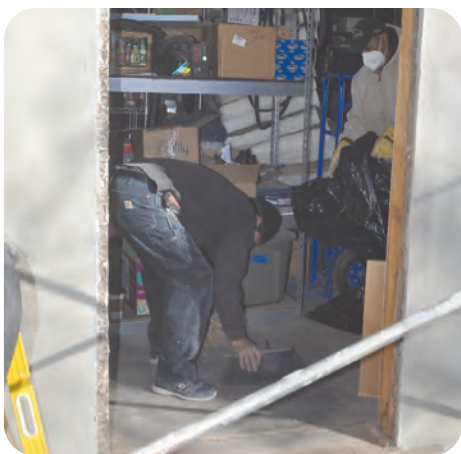
### TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- I-beam Level
- Caulk Gun
- Spray Foam Gun
- Jamb Saw

### MATERIALS

- Lumber
- Shims
- Mechanical Fasteners
- Adhesive
- Spray Foam
- Caulk
- Insulation
- Weatherstrip
- Door Bottom
- Lock set

## 21-2 DOOR INSTALLATION



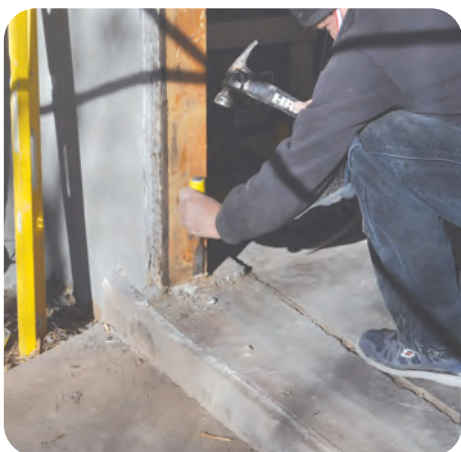
- 1.** Remove old door and clear away debris



- 2.** Measure opening and ensure the door on location is the proper size



- 3.** Prepare opening by ensuring that jacks are plumb and threshold is level



- 4.** Frame in and adjust opening as necessary to accommodate new door



- 5.** Attach flashing, if necessary, to protect any new materials from water intrusion



- 6.** Using shims, locate door in frame, adjusting for level and plumb and attach securely



## 21-2 DOOR INSTALLATION



- 7.** Ensure door is fully operational and lock set is aligned



- 8.** Insulate gaps between door jamb and frame



- 9.** Seal rough opening, to prevent both air and water intrusion



- 10.** Replace trim



- 11.** Seal along threshold, ensuring water will flow away from door

### NOTES

Check file for age  
of house and complete  
any required lead  
testing before work  
begins

## 22-1 WINDOW GLASS REPLACEMENT

Aligns with SWS 3.0201.1, 3.0201.4



### BEFORE

✗ Broken, cracked or missing glass breaks the pressure and thermal boundary



### AFTER

✓ Newly installed glass is sealed to prevent air and water infiltration

### TOOLS

- Heavy Work Gloves
- Glass Cutter
- Scraping Tool

### MATERIALS

- Cleaning Solution
- New Window Pane
- Silicone Caulk
- Window Glazing
- Tape

## 22-1 WINDOW GLASS REPLACEMENT



**1.** Remove all broken glass



**2.** Clean all debris, caulk, etc., from sash



**3.** Measure rough opening for window pane, size pane 1/8-3/16 inches less than RO



**4.** Run interior bead of caulk

### NOTES



## 22-1 WINDOW GLASS REPLACEMENT



**5.** Install new glass, using tempered where code requires, that meets or exceeds previous glazing



**6.** Hold new pane with tape or stops



**7.** Caulk all edges

### NOTES

# 23-1 INSULATE AN ELECTRIC DOMESTIC HOT WATER HEATER

Aligns with SWS 7.0301.2



## BEFORE YOU BEGIN

Check data plate on water heater to find existing insulation level (if any) and verify additional insulation is not prohibited



## AFTER

- ✓ A properly insulated water heater safely reduces standby losses

## TOOLS

- Utility Knife

## MATERIALS

- Water Heater Insulation Blanket
- Foil Tape
- Tie Strap
- Wire
- Twine

## 23-1 INSULATE AN ELECTRIC DOMESTIC HOT WATER HEATER



**1.** Insulate tank with minimum R-10 or better



**2.** Ensure a continuous vapor barrier with no gaps



**3.** Do not obstruct temperature and pressure relief valve (T&P)



**4.** Tape all seams and edges airtight



**5.** Cut flaps at access plates, tape them shut and then label from the exterior



**6.** Secure seams with tie strap, wire or twine and minimal compression

### NOTES



# 23-2 INSULATE A GAS DOMESTIC HOT WATER HEATER

Aligns with SWS 7.0301.2



## BEFORE YOU BEGIN

Check data plate on water heater to find existing insulation level (if any) and verify additional insulation is not prohibited



## AFTER

- ✓ A properly insulated water heater safely reduces standby losses

## TOOLS

- Utility Knife

## MATERIALS

- Water Heater Insulation Blanket
- Foil Tape
- Tie Strap
- Wire
- Twine

## 23-2 INSULATE A GAS DOMESTIC HOT WATER HEATER



1. Insulate tank with minimum R-10 or better



2. Ensure a continuous vapor barrier with no gaps



3. Cut insulation to allow 6 inch space to draft diverter and flue pipe



4. Do not obstruct burner access plate or combustion air intake

### NOTES

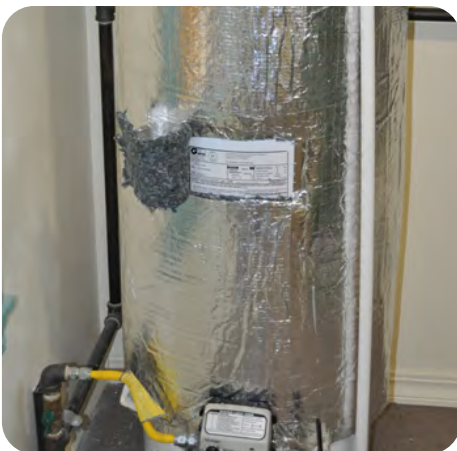
## 23-2 INSULATE A GAS DOMESTIC HOT WATER HEATER



- 5.** Do not obstruct temperature and pressure relief valve (T&P)



- 6.** Tape all seams and edges airtight



- 7.** Cut flaps at access plates, tape them shut and then label from the exterior



- 8.** Secure seams with tie strap, wire or twine and minimal compression

### NOTES



## 23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES

Aligns with SWS 7.0301.1



Insulate pipes to a minimum R-3 at least 6 feet from DHW on both hot and cold lines



Insulation should be continuous with no gaps

### TOOLS

- Utility Knife
- Measuring Tape

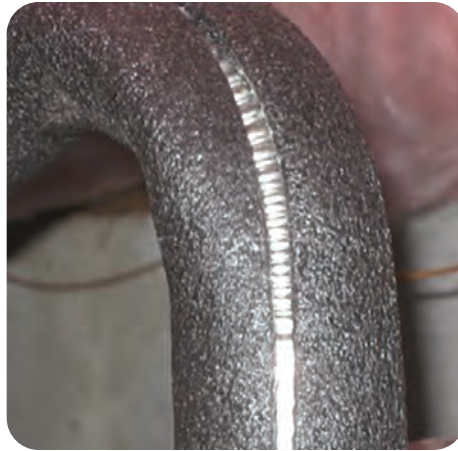
### MATERIALS

- Pipe Insulation
- Tape or Tie Straps

## 23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES



Keep insulation back at least 6 inches from draft diverter and single wall pipe



Do not rely on manufactured adhesive seam seal to hold closed



Secure seams with tape



When path is partially obstructed or curved, shape insulation to the location to eliminate gaps

### NOTES

## 24-1 INSTALL A LOW-FLOW SHOWERHEAD

Aligns with SWS 7.0201.1



### BEFORE

✗ Higher flow showerheads waste water and cause water heaters to run more than necessary



### AFTER

✓ Low-flow showerheads must be 2.5 gallon per minute (gpm) or less flow rate, to reduce heating load and encourage lower water use.

### TOOLS

- Adjustable Wrench
- Pipe Wrench
- Channel Locks
- Buffer Material
- Rag
- Toothbrush/Wire brush

### MATERIALS

- Thread Tape
- New Showerhead



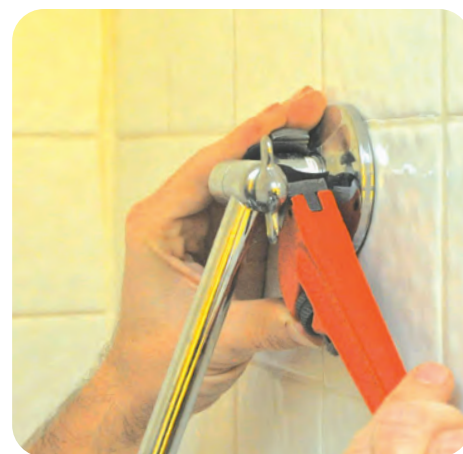
## 24-1 INSTALL A LOW-FLOW SHOWERHEAD



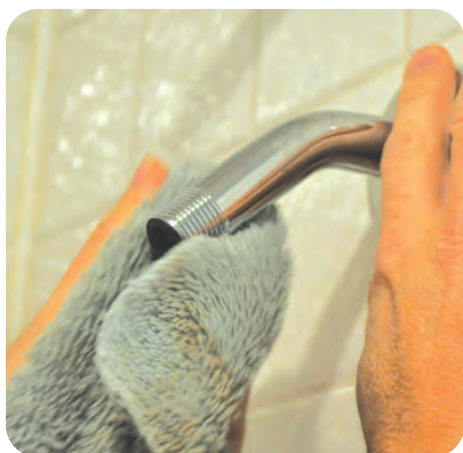
- 1.** Carefully remove old showerhead with adjustable wrench, taking care not to loosen shower arm



- 2.** If old showerhead does not have flat sides at connection, wrap with buffer material, such as a piece of rubber



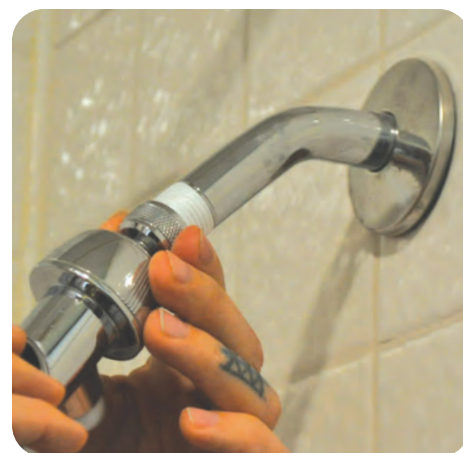
- 3.** Then use pipe wrench or channel locks to loosen connection at shower arm



- 4.** Clean threads of shower arm well to remove old residue



- 5.** Wrap new thread tape around threads



- 6.** Install new showerhead according to occupant needs, such as hand-held, shutoff or swivel

## 24-1 INSTALL A LOW-FLOW SHOWERHEAD



**7.** Ensure that connections will not leak while preventing damage by using buffer material



**8.** Use thread tape at all connections



**9.** Verify proper water flow and there are no leaks

### NOTES

## 24-2 INSTALL A LOW-FLOW FAUCET AERATOR

Aligns with SWS 7.0201.1



### BEFORE

- ✗ Faucets without aerators produce excess flow and old aerators can affect flow or cause leakage



### AFTER

- ✓ Low-flow faucet aerators limit flow to 2.2 gpm or less and reduce heating load by encouraging lower water use

### TOOLS

- Adjustable Wrench/  
Aerator Wrenches
- Soft Rag

### MATERIALS

- Thread Tape
- WaterSense Aerator



## 24-2 INSTALL A LOW-FLOW FAUCET AERATOR



- 1.** Using adjustable wrench or aerator wrench, gently remove old aerator, taking care not to damage faucet



- 2.** Once loose, continue removal by hand



- 3.** Clean threads of the faucet with a soft rag to remove any debris



- 4.** Verify size and type of aerator will work with faucet



- 5.** Wrap thread tape around new aerator if male, or faucet threads if it takes a female aerator



- 6.** Carefully install new aerator, ensuring any necessary rubber washers are in place and taking care not to cross-thread

## 24-2 INSTALL A LOW-FLOW FAUCET AERATOR



**7.** Do not overtighten aerator



**8.** Run water through new aerator to verify it is not cross-threaded and no water is leaking around sides



**9.** Remove old aerator from property and permanently dispose of it

### NOTES

For kitchen sinks, 1.0-1.5 gpm save water without affecting performance. For lavatory sinks, as low as 0.5 gpm is adequate

## 25-1 INSTALL ROOF VENT

Aligns with SWS 6.0101.2, 6.0201.1, 6.0201.2, 4.0188.2



### BEFORE

✗ Kitchens, bathrooms, and attics all have requirements for ventilation to the exterior, as well as dryer and combustion exhaust venting



### AFTER

✓ A properly installed vent preserves the integrity of the roof

### TOOLS

- Measuring Tape
- Drill
- Hole Saw
- Caulk Gun
- Utility Knife
- Mastik Brush

### MATERIALS

- Vent with Collar
- Caulk
- Mechanical Fasteners
- Joint Tape
- Mastik



## 25-1 INSTALL ROOF VENT



1. Determine the appropriate vent dependent on its use – attic ventilation, kitchen hood, bath fan, dryer exhaust (these should ideally be lower), or combustion exhaust
2. Locate ideal hole location from attic side of roof deck and drill center hole



3. Mark out size and location of hole on roof deck, verifying size of termination collar

### NOTES

## 25-1 INSTALL ROOF VENT



**4.** From roof side, cut hole slightly larger than termination collar. If shingle roof, cut just below one layer of shingles in order to preserve overlap

**5.** Run sealant around perimeter of vent and tuck under any surrounding uphill shingles. Seal uphill shingles over vent



**6.** Collar should extend down through roof into attic

**7.** Slide vent ducting to collar, sized to match the duct diameter, and attach with mechanical fasteners

**8.** Seal duct joints with mesh and mastic to complete vent installation. Insulate as required



## 25-2 LOCATE AN EXTERIOR TERMINATION

Aligns with SWS 6.0101.2

### CHECKLIST

- ✓ Locate all exhaust terminations to the outside – not attics and crawlspaces – and:



- ✓ At least 3 feet from the property line



- ✓ At least 3 feet from all operable openings



- ✓ At least 10 feet from a mechanical intake (Note: Pictured stacks are too close to one another)



- ✓ If near soffit, no open soffit venting for at least 6 feet on each side

### NOTES



## Index of Standard Work Specifications Referenced in Field Guide:

**\*\*Note:** Inclusion on this list does not imply that every Specification within the cited Detail is addressed in the Field Guide. Job Aids in parentheses ( ) presume referenced SWS has been followed.

2020 SWS	Detail Title	Job Aids
<b><u>2.0202.1</u></b>	Un-Vented Subspaces – Ground Cover	<u>16-1, 16-2</u>
<b><u>2.0202.2</u></b>	Vented Subspaces – Ground Cover	<u>16-1, 16-2</u>
<b><u>2.0202.3</u></b>	Pier and Skirting Foundations – Ground Cover	<u>16-1, 16-2</u>
<b><u>3.0101.1</u></b>	Air Sealing Holes	<u>2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 8-1, 8-2, 13-1, 13-2, 13-3</u>
<b><u>3.0102.1</u></b>	Sealing Non-Insulation Contact Recessed Light	<u>3-2</u>
<b><u>3.0102.2</u></b>	Sealing High-Temperature Devices	<u>3-1</u>
<b><u>3.0102.4</u></b>	Sealing Firewalls	<u>2-4</u>
<b><u>3.0102.5</u></b>	MH Belly Repair – Soft Bottom Patching	<u>(15-1)</u>
<b><u>3.0102.6</u></b>	MH Belly Repair – Soft Bottom Replacement	<u>(15-1)</u>
<b><u>3.0102.7</u></b>	MH Belly Repair – Rigid Bottom Patching	<u>(15-1)</u>
<b><u>3.0102.9</u></b>	Sealing Dropped Soffits/Bulkheads	<u>2-2</u>
<b><u>3.0102.11</u></b>	Sealing Roof/Wall Connections	<u>2-1, 8-1</u>
<b><u>3.0103.1</u></b>	Access Doors and Hatches	<u>5-1, 5-2</u>
<b><u>3.0104.1</u></b>	Closed Crawlspace Air Sealing	<u>12-1, 13-1, 13-2, (16-1, 16-2)</u>
<b><u>3.0201.1</u></b>	Window Air Sealing	<u>22-1</u>
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